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RCM radio control MODELER

RC MODELER MAGAZINE

THE WORLDS LEADING PUBLICATION FOR THE RADIO CONTROL ENTHUSIAST

ELECTRONIC SERVO MIXING
CHRISTY MIXER

FROM DAWN TO DUSK
SOLAR POWER

SPORT SCALE
PBY CATALINA

QUARTER MIDGET RACER
MISS COSMIC WIND

STANDARD CLASS SAILPLANE
THE SUNDANCER

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

SPECIAL 200 PAGE BICENTENNIAL ISSUE

VOLUME 13 1976 NUMBER 7

FEATURES

This Month's Cover is a beautiful North American T-28B, constructed by Mike Montrois of Hilton, New York, from the Dave Platt kit. Finished with Sig Dope in authentic U.S. Navy training color scheme, it is powered by a Super Tigre G60 and equipped with a Kraft 7-channel. Ektachrome transparency by Bob Clemens of Rochester, New York.

JULY

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FROM THE SHOP

Don Dewey

●This issue is RCM's Bicentennial commemorative issue, celebrating the two hundredth anniversary of the United States of America. In honor of this event, this issue of RCM contains 200 pages and, as such, is the largest specialized model aviation magazine ever published in this country.

You will find that this 200 page issue contains quite a bit more than just a large number of pages. There is, in fact, several "state-of-the-art" features which have never before been presented or discussed in detail in any publication. One of these is the long awaited Christy Mixer - - - an electronic mixing device which allows you to electronically select a proportional amount of mixing between two servos to operate functions that previously required a mechanical mixing device.

Another feature, presented in this month's issue, is the Sunbird, a detailed article on the use of solar cells for duration sailplanes which will virtually allow you to fly all day and an hour or two into dusk on a 225 mah battery pack!

And, in addition to the presentation of a sport scale PBY Catalina designed for two .10 engines, a totally scale Swiss Colibri, a super fast Half-A pylon racer, and a sailplane, there is a complete construction article for an all aluminum helicopter, the "Tin Lizzie" designed to utilize commercial mechanics, and which can be constructed using ordinary shop tools with no special machining required.

Combine this with RCM's coverage of the 1976 Toledo Weak Signals Conference, and we think you're going to find this special Bicentennial issue to be the best RCM ever! At least, the entire staff has given it our very best shot . . .

★ ★

Following on the heels of the disclosure that we are sharing our 72-75 MHz frequencies with industrial, commercial, and emergency services, the loss of the 27 MHz frequencies is, virtually, the final straw. And, the AMA officials express very little hope that these frequencies could be saved and, in fact, are almost certain that FCC Docket 20120 will be passed. When you consider that there are several million CB'ers in this country with a multi-million dollar radio industry constantly lobbying for additional frequencies (and they have 69 frequencies now using upper and lower sideband as well as the standard 27 MHz frequencies) compared to one hundred thousand RC'ers with virtually no lobbying power, you can see why this action has taken place.

We, at RCM, are not presenting this information in order to enter on another crusade. Last month, we inserted a petition form just before press time, due to a May 26 response deadline to the FCC. After 13 years of publication, and an equal number of "crusades" we feel somewhat like a worn-out Don Quixote riding a tired old nag and jousting at windmills with a wet noodle. It's not that we're not interested, and it's not that we don't care — neither could be farther from the truth! But all you have to do is read the AMA release and it says it all. If you read between the lines, it says that 100 thousand RC'ers who, for the most part, have abided by every law and regulation of the Federal Communications Commission in the operation of their equipment; who have observed high safety standards and regulations, have lost out to a majority of CB operators who, for in many cases, totally ignore the rules and regulations of the FCC. And if you are in doubt of this fact, read the FCC rules and regulations pertaining to Citizens Band operation, and then listen in on any of the Citizen Band Class D stations and see how many "legal" stations you can find!

Whether it's right or wrong is now of little concern. Whose fault it is that we lost these frequencies is rather insignificant. What is of significance is how we continue to operate with only the 72-75 MHz frequencies. For example, how do you run a 200 entrant

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CUNNINGHAM ON R/C

BY CHUCK CUNNINGHAM

O.K. gang, the flying season is in full swing all over the country. Old time pilots are pushing their birds all over the sky, while the newcomers, are watching, and wondering why it's so difficult to learn. Well, for you expert fliers and long time pilots, just turn the page and go on to something else in this issue, because this month it is time for a flying course for beginners.

If you're new to this hobby and sport, this months column is for you, because we are going to examine the mysteries of flight, what to do, when to do it, and perhaps a little "how come you do it" along the way. If you don't yet have a radio and aircraft, read on anyhow, because even though you're not a full fledged hard cash paying member of this fraternity, you're about to get your feet wet!

First, let's do a little bit of ground school. Draw up your chair, look at the blackboard, and stay awake. For the purpose of this instruction we are going to make several assumptions. First, we are going to assume that you have a trainer type aircraft, equipped with ailerons and tricycle gear. Further, we are going to assume that your transmitter has at least four channels, and that your equipment is set up so that the throttle and rudder servos are slave to the sticks on the left side of the transmitter, under your left thumb, and that the ailerons and elevator are responding to gentle nudges from your right thumb. If you fly the other way around, or single stick, you will just have to interpret as we go along. One further assumption we are going to make is that you have some help along the flight line and that you're not going into this all by yourself. If you are in **that** category, then we have assumed the wrong things for you to use as a beginner, but more on that later.

Now, being in ground school doesn't prevent you from bringing your aircraft and transmitter - - - in fact, the faculty of this ground school insists on it. Step number one: Put your aircraft all together, turn on the transmitter switch and the receiver switch and see that everything moves. It does? Swell, now, pay attention. Does each surface move the correct way when you move the transmitter stick?

Let's look at each surface. First, pull the elevator stick toward you. Does the elevator move upward? It does. Okay, up is up, now, how about down? It should be alright too . . . but, how much up and down movement did you get? Most aircraft fly just fine with about 3/16" up movement, and 3/16" down movement. If the aircraft is balanced nose heavy it may take a bit more up movement than 3/16", but this is a pretty good starting point. You don't need nearly as much up elevator as you might think that you do. If you are flying a very slow flying aircraft, then you will need more elevator movement, but for the first time out, with a first aircraft, moderation is best.

Next, try the rudder. Give the rudder stick a right rudder movement. Did the rudder swing to the right? Great, but, how about the nose wheel? Did it swing to the left? If it did, and believe me, this does happen a lot of the time, then you've got it hooked up backwards. Check it to be sure. Also, the rudder does not need to swing more than 1/2" to each side for your initial flights. Now, again, this is meant for just a beginning trainer with ailerons - - - later on you may want to swing the rudder on a particular aircraft quite a bit more, but save that for later.

All right, now lets take a look at the ailerons. Move the aileron stick to the right. What do the ailerons do? Does the left aileron go down and does the right aileron go up? Terrific, you've got them hooked up correctly. But if they are the other way around you've got troubles, and no more ground school until you have them hooked up the right way.

Why do you get a right turn if the left aileron goes down, and the right goes up? Simple. By lowering the aileron on the left wing panel you create more lift for that wing. By raising the aileron on the right wing panel you decrease the lift of that wing. The result is that the left wing goes up, the right wing goes down and, then by a bit of pressure on the elevator, which has now tipped up to the vertical position, the nose of the aircraft comes around in a banked right turn. But, more on making turns later. Once again, look to see just how much surface movement you have at full aileron deflection. 1/8" each way from neutral position is more than enough for most aircraft. Some planes need more movement and some need less, but, 1/8" is an excellent place to begin.

The final control check is the movement of the throttle. A forward push on the the throttle stick should move the engine throttle to full open position. A pull to low position should move the engine throttle to the closed position. We will not go into setting the throttle for best idle, as that is a subject that is best covered by Clarence Lee, and one which he has discussed very thoroughly.

If everything is working properly, and there is no binding in the linkages, it is time for a coffee break, then on to the second phase of ground school.

Now, students and sports fans, once again grab your transmitter. Don't extend the antenna, and don't turn on the switch - - - just pick it up and hold it in both hands. Place your thumbs on the two control sticks and see how comfortable this is. Some fliers with short thumbs, or small hands may have to have shorter sticks made for them but

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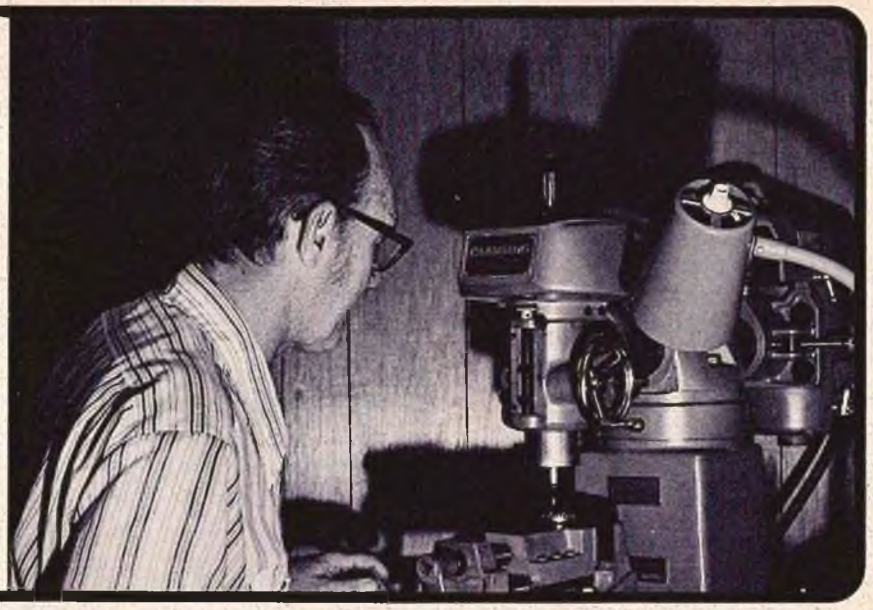
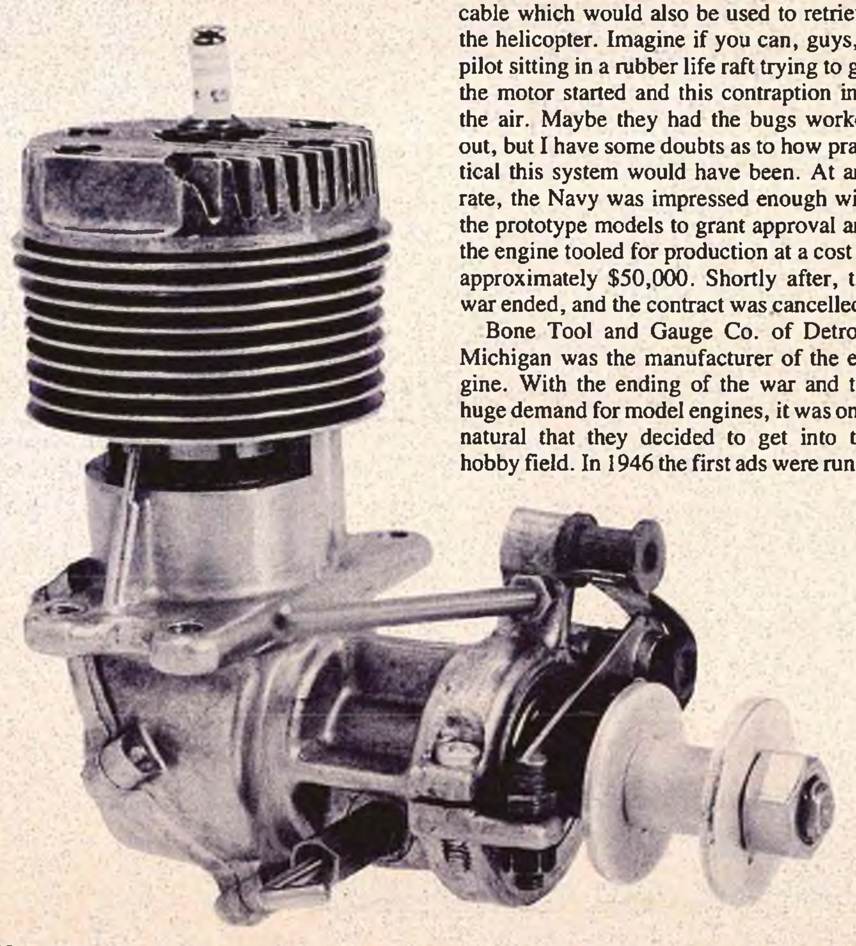
engine clinic

By Clarence Lee



● This month we have the third engine in our series on the unusual and lesser known engines of the past. The name of the engine is the Howler. The Howler was designed by a Mr. Lee Fowler, a two-cycle engine engineer and, at one time Chief Engineer of the now defunct Detroit Outboard Motor Co. The engine was developed during WW II with the prospect of obtaining a Navy contract. During WW II Navy pilots and Air Force pilots flying over water carried rubber life rafts that were equipped with radio transmitters. These were known as "Gibson Girls" due to their figure 8 shape.



This configuration allowed the transmitter to be held between the knees while a crank on the top was turned sending out an emergency signal. The unit had its own generator (energized by turning the crank) so no batteries were required. The range was very limited without an antenna, naturally, so a kite was part of the survival kit that would raise a wire antenna increasing the radio's range. However, on a calm day the kite was useless. Here's where the Howler enters the picture. It was intended to be used in a small helicopter containing the radio signaling device which could be sent aloft. The height was controlled by a retaining cable which would also be used to retrieve the helicopter. Imagine if you can, guys, a pilot sitting in a rubber life raft trying to get the motor started and this contraption into the air. Maybe they had the bugs worked out, but I have some doubts as to how practical this system would have been. At any rate, the Navy was impressed enough with the prototype models to grant approval and the engine tooled for production at a cost of approximately $50,000. Shortly after, the war ended, and the contract was cancelled.

Bone Tool and Gauge Co. of Detroit, Michigan was the manufacturer of the engine. With the ending of the war and the huge demand for model engines, it was only natural that they decided to get into the hobby field. In 1946 the first ads were run in the model magazines announcing the engine. It soon became evident, however, that they could not maintain the quality required by the Navy and stay competitive price-wise with the cheaper engines on the market such as Ohlsson, Super Cyclones, etc. So in early 1947 they folded shop.

To all outward appearances the engine does not differ too much from our present day engines. The crankcase does split on an angle, eliminating the back cover. The purpose of this was the ability to keep the bore of the cylinder and the bore of the crankshaft at exact right angles to each other. This is reminiscent of some of Duke Fox's designs. However, take a close look at the engine and you will notice that something is missing — an air intake! The air intake was by sub-piston induction. When the piston was at the top of its stroke the piston skirt uncovers the exhaust port and all air intake is through the exhaust port. Needless to say, this is not the most efficient method of getting air into the engine. A good portion of the intake air is going to be mixed with the spent exhaust gasses. It does prove one point however. Many of you have questioned whether there was any advantage to sub-piston induction or "free porting". Many engines have used this in the past as a means of getting extra air into an engine. However, not to the extent as used by the Howler. The piston skirt in engines using sub-piston induction usually only raised .020" — .030" above the bottom of the exhaust. Many fellows have questioned whether any air was actually being induced or not. The Howler does prove that air can be drawn through the exhaust. Sub-piston induction, or "free porting", is only beneficial if the engine can not get enough air through the venturi. If the engines needs are supplied by the normal air intake than free porting will be of no advantage. However, many engines, in years past, used small intakes to increase fuel draw at the needle valve and then also incorporated sub-piston induction, or free porting, to get more air into the engine. A mod-

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ON THE LINE!

the soaring scene
by lee renaud

Support Your National R/C Soaring Organizations

LEAGUE OF SILENT FLIGHT
P.O. Box 39068 R
Chicago, Illinois 60639

NATIONAL SOARING SOCIETY
1481 Howell Branch
Winter Park, Florida 32789

ABOVE: Some of the twenty-five contestants who entered the South African Soaring Nationals. RIGHT: First Place winner, Noel Drew, and his Aquila.

● **TOLEDO 1976:** The Weak Signals Club of Toledo, Ohio, did it again with the 21st Annual R/C Exhibition held April 3, 4, and 5. Jammed with new products for the R/C flier, this show is the big event of each year. We have attended and displayed for the last four years, and this was the best yet.

We promised to cover the show from the soaring enthusiasts viewpoint. The following comments were gathered by my good friends, Gordon Pearson and his son, Kevin. They tried hard to see everything, and we apologize if any new product concerning soaring is not included. We were just too busy in our own booth to find enough time to cover the show thoroughly.

Heath: Weather Station Kit — measures indoor and outdoor temperature, barometric pressure and wind speed and direction. They also have a digital wind speed and direction indicator. For the serious sailplaner who can't afford to take the time to go to his favorite slope or site only to find the wind in the wrong direction.

Ralvin Industries: The Nebula MKII looks like an interesting open class sailplane with a span of 122" for 936 square inches. Priced under $55.00 it enables a builder to get into the "large" class ship at a low price.

Aristocraft: Showed two interesting new ships that will be available this summer. The Kalif and SB-10. The SB-10 is an all fiberglass bird with articulated outer wing panels. They are rotated like ailerons for instant response. The center section may be removed and just the out-board panels used with articulation. A very interesting control concept. Both of these ships are in the unlimited class.

Midwest: Their newest addition is the Silent Squire. A 60" semi-symmetrical foam wing balsa box fuselage is for slope-sport and thermal. Looks like a great slope ship.

Tern Aero: Had on display a unique 85" super lightweight, stringer type fuselage for 2 channels. The name of this cutie is Arcturus and will be available later in 1976.

Mark's Models: Nothing new. 72" Wanderer kit or built-up available.

Peerless: Scale type ship — Libelle — 105" plastic fuselage. Not new.

Cannon Radio: New lightweight 3 channel with a total airborne weight of 4 ounces.

R/C Products / Northwest: Had on display a very interesting application of carbon filiament. This appeared to be 1/64" by 3/8" top and bottom spar application. The strength has to be seen to be believed. They also will build any sailplane to your specs, for a price, .

Craftair: Introduces two new competition ships. The SP100, a standard class ship, and a big 150", 1,643 square inch unlimited called the Sail-Aire. Featuring a fiberglass front and rolled balsa tail cone. Accessories were a new all flying stab bellcrank and "measured spot landing skid" made of neoprene foam rubber.

Sure Flite Products: Fancy finish trim tape that the car and pattern people use and a 60" slope machine with fiber fuselage and foam wing slope ship called the Deadbeat. Uses ailerons and elevators.

Bluewater Crafts, Ltd.: Displayed a new Peripod .049 to .09 auxiliary engine mount for those who do not wish to stretch out a high start or winch. This device is made of high impact plastic which is recovered via parachute when the engine quits. A complete unit with parachute is available.

J.P. Models: Javlin II. Not new but an interesting kit.

Pierce Aero Co.: Pierce Paragon and Pierce 970. Not new.

Astro Flight: New wing control method for yaw control. This method rotates the entire wing sections like ailerons. Very precise. Made of 30% fiber filled epoxy. Also had a 15 minute fast battery charger that runs off your automobile or winch battery.

Soaring Products: Don Clark says his business is still up and down. (Thermal sensors.)

Performance Flight Systems: A Bicentennial ready-to-fly ship, the Minuteman. A standard class ARF that is available in several stages of completion. Also the Rubber Ducky.

Soarcraft: Featuring their new (not so) Magnum 12. A high performance unlimited ship. Mr. Stock is showing a new 5 minute epoxy called Zip that is not supposed to get brittle.

Special Edition Plans: Displayed a new 38" single channel pulse cutie called the Gnome. This kit is priced under $7.00; a larger version for two channel and under — 15 bucks is planned.

Flite Glass: Offers Liquid Masking. A

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CLIPPED WING STEARMAN

Here's How To Modify A Sterling Stearman Kit.

BY RICHARD L. STEELY

Inspiration For A Project

A full scale pilot named Joe Miller once flew a beautiful clipped wing Stearman at an airshow I attended in 1948. After flying radio controlled Aeromasters and Sterling Stearmans myself for a few years, I thought that the ultimate would be a radio controlled clipped wing Stearman with scale-like characteristics similar to that one.

A Sterling Stearman kit has survived two years of trades and exchanges among my group of RC'ers. About half the fuselage had somehow been completed. Having owned it myself at one point, I now decided to make a trade with its present owner and get it back.

The Ultimate Stearman

Over a period of several years of R/C flying, there were many opportunities to build, re-build, modify, fly and repair several radio controlled Stearmans, both my own and those belonging to fellow RC'ers. Having my newly re-aquired Sterling Stearman kit at hand, I set about making all the changes I could think of that had proven successful on four previous models.

Construction Modifications

Wings:

A decrease in wing span from 64.5" down to 54", by removal of the wing tips to

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KIT VS. MODIFICATION FIGURES

Item	Kit	Modification	Difference
Wingspan	64.5	54	−10.5"
Area	1280	1080	−200 sq. in.
Aspect Ratio	6.35	5.4	−.95
Nose Arm	18.7%	23.2%	+4.5%
Tail Arm	49.3%	58%	+8.7%
Horizontal Area	12.6%	13.9%	+1.3%
Horizontal Volume	.388	.43	
Vertical Area	4.8%	5.7%	+0.9%
Vertical Volume	.024	.043	
Wing Loading	22	21	−1
Weight	12 lbs.	9 lbs., 12 oz.	

Quarter Midget

BY

DON DOMBROWSKI

AND FRED REESE

RACING AT RANDOM

Bob Nickle holds GLH-1 design by George Kurreck (right). With Bob flying, GLH-1 placed 4th out of 44 at recent Open Half-A Race at Sepulveda Basin in California.

● The meeting of the NMPRA-QM district VP's and other representitives at Toledo this year was significant. The meeting was not called to make the final AMA proposals, as the results of all the surveys were not in but, rather, to discuss the problems, determine policy, and offer suggestions and alternatives. We were very impressed by the group's willingness to arrive at workable solutions without the bloodshed of previous meetings. Solutions were agreed upon that I would not have believed possible in such a short session. The people were knowledgeable and willing to consider the opinions of others, and all of the major racing facets were represented.

We discussed at length the results of the direct mail CD survey which we felt is a good indicator of opinion as it represented about 300 individual contests. These results are printed later in this month's column. However, NMPRA-QM will wait until the reader survey results, from the last issue of RCM, come in to make the AMA rule proposal changes for the 1978 rule book. The current rules will be effective until then.

The group was unanimous in upholding the $60.00 engine cost limit in spite of AMA's refusal to act on this issue. We feel that this is a specification no different from a displacement size or a minimum wing area imposed upon the manufacturers. The manufacturers will, in turn, produce the best engines possible at that price.

The use of rear exhaust engines has brought us the problems of mini-pipes and exhaust extractors that can improve performance of the engine. Dick Hager, QM CD at the forthcoming Nats at Dayton, Ohio, explained his position and how he will handle exhaust extensions: "All exhaust extensions will have a 3/8" wide slot cut in from the open end to within 1/4" of the exhaust port of the engine. This includes Taipans." Further, he stated he will not allow a tight cover over the slot which could negate the slot.

The slotted extension is effective for now but puts too much of a burden on the CD to enforce. A NMPRA-QM CD guide had already been proposed, and agreed upon, that would cover this and other areas such as canopy, fuselage and cheek cowl cross sections based upon the survey results. The suggestion was to include a list of NMPRA-QM approved, stock exhaust extensions as provided by the original engine manufacturer that could be used, including their dimensions. This is the policy of most auto racing associations for racing accessories. The suggestion for the approved accessory list was well received and is probably the best workable solution as the definitions will be clear.

It appears that the majority favors the use of modified props for QM racing and will probably be proposed to the AMA. After seeing how readily flyers took to modifying 1/2A props, we no longer feel that this will be a problem.

The race course was discussed and there was no decisive preference for one course or the other since some groups needed an alter-

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A Quarter Midget Caudron kitted by Pappy deBolt. This deluxe kit features one-piece construction with a removable power pod. The large wing provides a lower wing loading and improved handling.

nate course in order to race because of field conditions or manpower limitations. It was suggested and agreed that the existing AMA course and FI type scoring be used for all national events, but to allow the 400' (1.7 mile) short course, and simplified QMRC scoring, to be used as an alternative when conditions are not conducive for the long course and flagmen.

Our thanks go out to George Zink who is providing fair and effective leadership for QM racing based on how, you the flyers, want the event to be.

NEW PRODUCTS SEEN AT TOLEDO

We saw the new Cox 15 at Toledo and it looks very good. Disassembly showed us some unique features that will make the Cox 15 tough to beat at $59.95. Not to be outdone, World Engines showed the all-new Super Tigre X-15 RC front intake, Schneurle ported QM engine with a new enlarged Mag Carburetor. The X-15 and the Cox 15 should be available by the time you read this. Duke Fox also had his new racing 15 on display.

Cox will be marketing a new conventional style glow plug for racing and sport flying. Preliminary reports are that they are very good. Fusite is now distributing their Glo-Bee racing plugs nationally, making them more readily available.

We talked to Pappy DeBolt about his new Caudrom QM kit. The design has some excellent features. The Caudron design is all balsa with hard maple machine engine mounts in the "power pod". The wing is integral with the fuselage, jig built, and sheet covered. This makes an ultra light weight (14 oz.), yet rugged, airframe so important for the smaller RC planes. An exclusive new feature is the "power pod". Loosening two screws gives immediate access to the engine, fuel tank and RC installation. The wing span is 41½" and area is 340 sq. in. The larger-than-normal wing and stabilizer will improve performance in the turns making the ship easy to handle and a good choice for people just entering QM racing. The Caudron kit includes full size plans and all required hardware for $42.95. Manufactured by DeBolt Model Engineering Co., 3833 Harlem Rd. Buffalo, New York 10015.

RACING CALENDAR

June

6 Toledo, Ohio, Weak Signals

6 1/2A, Ventura, Cal., Ventura Comets

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NMPRA-QM CONTEST DIRECTOR SURVEY RESULTS — RULES SECTION

0 = Definitely in favor 1 = Slightly in favor 2 = Slightly opposed 3 = Definitely opposed 4 = No opinion

	(0)	(1)	(2)	(3)	(4)
1. Limit of 2 airplanes per contestant.	68%	10%	3%	10%	10%
2. Allow replicas of jet racers.	18%	15%	11%	39%	18%
3. Allow replicas of model aircraft.	19%	6%	15%	50%	10%
4. Allow commercially available customized engines.	8%	8%	13%	68%	3%
5. Allow unlimited modification of engines.	11%	5%	5%	76%	3%
6. Engines must be produced in quant. of 1,000 or more.	92%	2%	5%	0%	2%
7. Engines must be packaged with a carburetor.	71%	11%	3%	8%	6%
8. Any .15 carburetor should be allowed.	27%	16%	10%	42%	5%
9. Any carburetor should be allowed.	15%	8%	3%	71%	3%
10. Allow fuel tank pressurization.	19%	15%	11%	53%	2%
11. Allow engine inspection for a fee.	40%	29%	6%	16%	8%
12. Allow engine claiming, list price plus fee.	24%	18%	11%	42%	5%
13. Engine must be available 60 days prior to use.	61%	21%	5%	8%	5%
14. Mandatory engine inspection for winners.	21%	27%	13%	34%	5%
15. Allow tuned pipes.	5%	5%	6%	82%	2%
16. Allow any type exhaust extractor.	18%	5%	13%	58%	6%
17. Access. must be available in quant. of 1,000 or more.	50%	23%	10%	13%	5%
18. Propellors must be available 60 days prior to use.	50%	23%	10%	13%	5%
19. Allow propellor modification.	39%	23%	8%	31%	0%
20. Fuse height and width must be meas. at the same location.	23%	13%	19%	37%	8%
21. Fuse. height measured within wing chord.	58%	15%	10%	13%	5%
22. Fuse width measured within wing chord.	66%	19%	3%	6%	5%
23. Fuse. height measured at single former crosssection. No staggering top and bottom.	52%	11%	11%	18%	8%
24. Model must resemble orig., incl. cowls, scoops, canopies, etc.	61%	18%	6%	13%	2%
25. Min. size requirement on cheek cowls, scoops, canopies, etc.	37%	23%	13%	21%	6%
26. Allow use of double backed tape to hold in servos.	11%	10%	11%	63%	5%
27. Safety inspect. sole responsibility of C.D.	47%	23%	11%	19%	0%
28. Establish a written standard for each item of safety concerning a racing aircraft.	50%	24%	11%	8%	6%
29. Allow no mods to the throat area of a carburetor.	77%	6%	5%	8%	3%
30. Allow minimum of 90 sec. starting time.	73%	11%	2%	10%	5%
31. Require all engines to demonstrate idle before each heat in every round.	10%	10%	13%	66%	2%
32. Require all engines to demonstrate idle before each heat in one round only.	10%	18%	16%	53%	3%
33. Require all engines to demonstrate idle before the first heat of the day.	13%	15%	21%	48%	3%
34. Spot check for idle demonstration only.	18%	16%	11%	52%	3%
35. Aircraft must remain motionless during idle demonstration as alternative idle test.	19%	18%	13%	47%	3%
36. No idle demonstration, but penalty for landing without engine running.	40%	8%	19%	26%	6%
37. No idle demonstration, no landing penalty.	11%	6%	6%	68%	8%
38. Engine must idle below 5,000 rpm to pass idle demonstration.	24%	6%	11%	48%	12%
39. Engine must idle below 4,000 rpm to pass idle demonstration.	15%	8%	11%	56%	10%
40. Allow an airborne booster battery for the glow plug. Used during idle demonstration.	26%	15%	6%	40%	13%
41. Fuel should be supplied at a fuel station.	89%	6%	0%	2%	3%
42. Fuel should be unlimited.	8%	10%	6%	69%	6%
43. Standardize the course length at 2 mi.	42%	8%	18%	23%	10%
44. Standardize the course length at 1.7 mi. This is the 10 lap distance for the 400' course layout.	34%	16%	11%	27%	11%
45. Standardize the course length at 1.5 mi.	6%	10%	18%	52%	15%
46. Hard hats should be required by all workers, fliers & helpers on the line and at the pylons.	48%	21%	11%	13%	6%

Percentages given are to the nearest whole number. They do not necessarily add up to 100%, but this is due only to not carrying the extra decimal places due to lack of space.

Percentages shown are taken from a computer run with 60% of the questionnaires we sent out returned. You may see results of this survey in the modeling media where the percentages do not agree with this one. This is strictly due to updating the data. At this time we already have 65% of the questionnaires returned. Percentage changes are not expected to vary significantly.

Look for our Fliers Questionnaire appearing in the June issue of RCM. That questionnaire was designed to resolve the issues which this one showed to be controversial or evenly divided.

We thank you for taking the time to answer our questionnaire and for your concern for the future of Quarter Midget racing. George Zink, President, NMPRA-QM

PBY-2 CATALINA

In its own way, the Consolidated PBY Catalina is like the DC-3 and the J-3 Cub - - - - it has earned its place in a select group of classic aircraft that promote unbridled nostalgia and great affection.

By Bud Chappell

The Consolidated PBY Catalina is ugly! The streamlining that it does possess is compromised by many examples of parasitic or induced drag. It cannot boast of speed, or comfort, or nimble maneuvering to offset its numerous drawbacks. But in its own way, like the DC-3 and the J-3 Cub, it has earned its place in a select group of aircraft that promote unbridled nostalgia and great affection. These facts, when mixed with a little challenge, make the Catalina an ideal subject for one of the Classic Models.

The features that make it easily recognizable by anyone with the slightest interest in aviation are the same features that seem to cause model designers to shy away. A pylon-mounted wing with struts is not so bad in itself, but the fact that the pylon base must be removable and waterproof is a little more difficult. Adding twin engines to the above, apparently must have exhausted nearly all of the enthusiasm to develop this model; pointed up by the obvious lack of an R/C kit, or even plans except for one or two attempts that have been around for a long time.

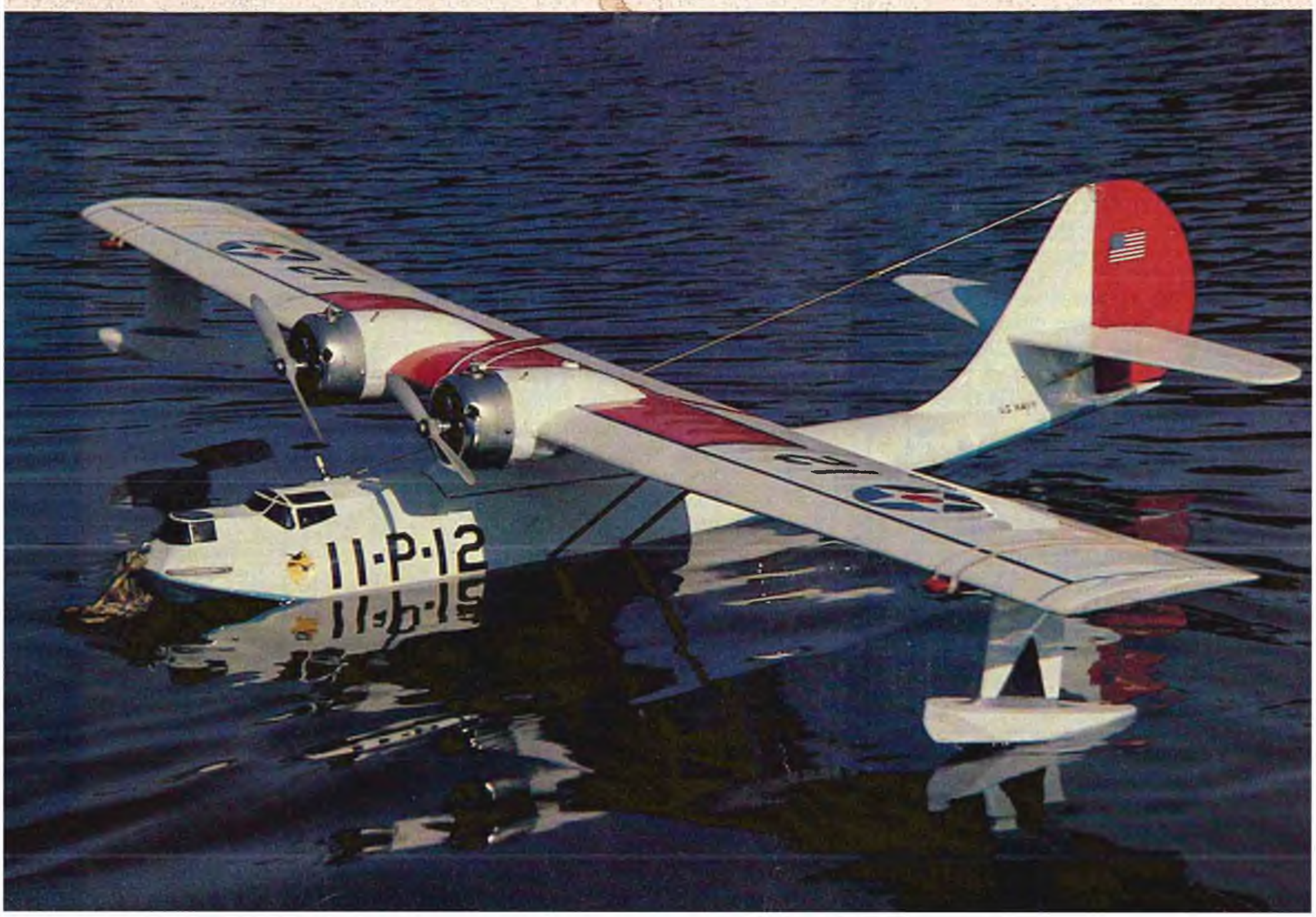
The Catalina is not an easy model to build. The construction methods used are not very difficult, but many methods are incorporated in this plane that require lots of time and patience.

On the other hand, if you enjoy building Sport Scale models and especially hydro models, the results and rewards that this airplane can give in return are worth all the time and trouble.

Weighing in at approximately 5 pounds, the plane is powered by two O.S. .10 R/C engines, which I promote and plug all the time. They simply do a great job. The plans are designed as a three channel machine, and I'm sure, as I write this, someone will be thinking that two .15's and ailerons would be even better. Very possibly they are right, but my basic premise in developing Sport Scale models is to keep power, size, weight, and cost at the level where it is sensible and attractively economical.

Apparently, some modelers don't feel secure when considering a twin engined model unless they have two .40's or .60's to haul their creations around. I don't agree with this waste of power and actually feel that many scale-type ships that are built this way suffer terribly from over-power and speeds far in excess of aircraft structural capability and pilot control ability. In general, keeping the model light, simple, and adequately powered is the formula for me. This keeps cost at a minimum, and produces a really flyable airplane.

And flyable is the Catalina's best quality! Taxi her into the wind, open the throttles, a little back-pressure on the stick has her barreling along on the step and then comes that majestic rise from the water — that exhilarating transformation from boat to airplane! Make your climbing left turn to the left, trim a little if you like, and bring the throttles back to one-half. Watching her cruise overhead with that twin-engine gutteral sound always brings out goose bumps



on my neck. How about you - - - do you get the same feeling? Are you ready to start building? If so, let's go!

First, carefully study the plans. Try to visualize the different steps involved. Then, cut from 1/8" balsa sheet all of the fuselage bulkheads and formers, and the backbone or keel pieces. One exception here is bulkhead "C", which is sawn from 1/8" plywood.

The tray that is formed by gluing 1/16" sheet balsa inside the formers from A2 to F is a plus in the construction method that gives the hull a great deal of strength. Glue the forward and bottom keel sections to these bulkheads, and then glue on the remaining keel pieces that provide the outline for the top and rear of the hull. Also glue in the tailpost K at this time. One nice thing about this type of construction is that it begins to look like something early in the building stages.

Once all the hull formers are in place, the chine strips and rear side strips are put on. Up to this point, the hull is quite flexible in the rear, and the strips just mentioned allow adjustment and alignment as you go along. The pine wing strut strips come next, followed by the hatch rails of 1/4" x 3/8" balsa. The hull, at this point, will become much stronger and easier to handle.

The entire hull is covered with 1/64" plywood, 3-ply wingskin material, which was chosen for its high strength to weight ratio, and its ability to be bent smoothly around the formers. The material I used was purchased from Sig Mfg. Co., and was very satisfactory.

Cover the bottom first, using pieces that fit only the square from the keel out to the chine and from the center of one former to the next. In short, the hull is covered with lots of small pieces. Also, the top of the hull has very few large pieces because it is too hard to glue much of an area and pin on the skin before the glue dries. However, don't cover the rear from bulkhead F until the pushrods are installed.

This would be the proper time to construct and install the elevator horn, which is exactly like a control line type split elevator installation with the exception of the horn itself pointing directly forward instead of down, when it is installed. The rudder horn, I would like to mention, was purposely not hidden in the hull because of the problem of trying to waterproof the rudder hinge/linkage area.

When the hull has been covered and the nose and tail blocks have been sanded to contour, it is time to construct the pylon. Select a piece of hard 1/8" balsa sheet and cut pieces to cover the hatch, grain crosswise. When these have been glued together, mark off a centerline and glue on the 7/8" x 3/4" balsa strip. To this strip, glue on the 1/16" plywood side plates. Install the front and rear balsa blocks. Next, glue in the pine header strip, using liberal amounts of your favorite epoxy and some type of clamping arrangement — such as clothespins. Then, put the triangular balsa along each side of the header strip. This forms a base for the 3/16" plywood wing seat which, in

turn, is drilled and tapped for the wing hold-down screws.

At this point, the dowels should be epoxied to the bottom of the pylon assembly. Take special care to align them correctly and glue very strongly, because they carry most of the wing/hull load. The rear pylon hold-down screws are next, with holes drilled through the rear of the pylon that match the hardwood blocks in the rear corners of the radio compartment. Also glue in a spacer block between the hardwood blocks just mentioned to provide a continuous seat for the foam cushion material.

A little trick I thought of to increase the effectiveness of the foam cushion material as a water seal is this: Glue a piece of heavy mailing twine to the bottom edges of the pylon assembly and across the front of C2 on the front of the pylon assembly. When the pylon is then set into place, the twine will push deeply into the cushion, and prevent water from getting past this point. It is also helpful in equalizing a slightly uneven fit in the pylon construction. Doping the twine is important, too, to keep the twine from soaking up water. Incidently, the pylon assembly is painted with two coats of sanding sealer, and then two coats of color to match whatever scheme the builder intends to use. The original model shown in this article was decorated in the colors of the U.S. Navy, San Diego, California 1938, as shown in the Profile Publication of the PBY. The engine nacelle assemblies should also be doped. The rest of the airframe is covered with Super MonoKote and Trim MonoKote for strength and complete water proofing, but the compound curves of the pylon and the nacelles are extremely difficult to decorate otherwise.

The wing is probably the most conventional part of the model to build, much like most built-up kit wings in other current models. A couple of unusual things to be mentioned are the wing tips which are the floats in the retracted position. As shown on the plans, a set of flying floats should be built and fastened to the wing with rubber bands. This flexible method is not too fancy, but very durable and forgiving to the wing structure.

After the basic wing is assembled, the plywood wing seat plate and the engine nacelle plates are epoxied on, with the next step being to glue up the blocks that form the engine nacelle shapes. Tanks, cowlings, and throttle linkage pretty well finish up this phase.

Some of you modelers may choose to modify this plan to build the PBY 5, or 6. Most of the difference is in the tail group and blisters.

This idea might be interesting to those who would like to build a different version of the PBY. I looked a long time for a commercially packaged product that would provide the proper plastic shape to lend itself to double for the blisters that are the trademark of the later models of the Catalina. I had no way to form them, and I would guess most builders would have the same problem. Fortunately, I discovered an excellent item, in the cosmetic section of a Woolworth's Dept. Store. It is called a "Goody" Hair Foundation, mfg. by the H. Goodman & Sons Co., Inc., N.Y., 10001.

The cost is now 59 cents, and when modified slightly, will do a very creditable job. Some of the "bars" should be cut away to make the window sections look larger. Black MonoKote should be used under each blister unit to give the correct appearance of depth. By also changing the outline of the rudder, which is also not difficult, the builder can construct the late PBY 4 or the PBY 5. If the PBY 5A is chosen, wheels must also be added or simulated on the side of the hull between the lift struts. One of the most complete works of information I have seen on the history of the PBY is found in a current publication called "Wings," Volume 5, #2, April, 1975. Published at Sentry Magazines, 1120 Ave. of Americas, N.Y. 10036, it is $1.25 and packed with information and pictures that are just fantastic. It is a nostalgic gold mine.

I chose the 2 model, for the generous rudder lends itself to the 3 channel type of control. Of course, the PBY 5 has a redesigned and smaller rudder, which would make single-engine operation much more difficult to manage. With the "2" rudder, the model flies quite well on one engine, and will do nearly all mild maneuvers, except take-off. In fact, with both engines pulling well together throughout the flight, the ease with which this model flies is reminiscent of handling an H-Ray. The long wing and average wing loading are a good combination that produces a lot of lift at low speed and loafs along at cruise like a sailplane.

At this point, I would like to offer a couple of hints in areas that might not have been too clear on the plan. The stabilizer should have about 2 degrees of positive incidence; the opposite of the trim on many models. Be sure not to set the stab at zero incidence — you'll have to fly with down elevator most of the time if you do.

The original model has a tendency to be tail heavy and keeping this in mind as you build will help to diminish this problem. Try to keep the tail structure as light as possible. However, some nose weight may have to be added. The spray rails up front offer a chance to slip in more weight here. I hit on the idea of making them from 16 penny nails (spikes) in the shape of outsized staples, filleted with RTV Silicone rubber material. The results were excellent and provided the extra weight in the form of a functional detail.

This plane will also operate from land on wheels. By making a long vertical hole in the nose at Point A1, and epoxying in a section of 1/8" brass tubing, a pivot point is made to accept a nosewheel. The proper sized wire to go into the tubing should be shaped like a large tailwheel yoke, and long enough to extend through the tubing to be secured by a wheel collar. Even though the nosewheel has no steering capability, it swivels at the command of the large rudder and allows the model to taxi very well.

For the main gear, bend a blank such as a Hallco Gear to fit the bottom of the hull, and then down to meet the main wheels on each side. This unit is then strapped to the wing struts with rubber bands which are hooked together with wire "S" hooks. Be sure to pad the gear blank under the hull with wing seat cushion strips to prevent damage to the bottom.

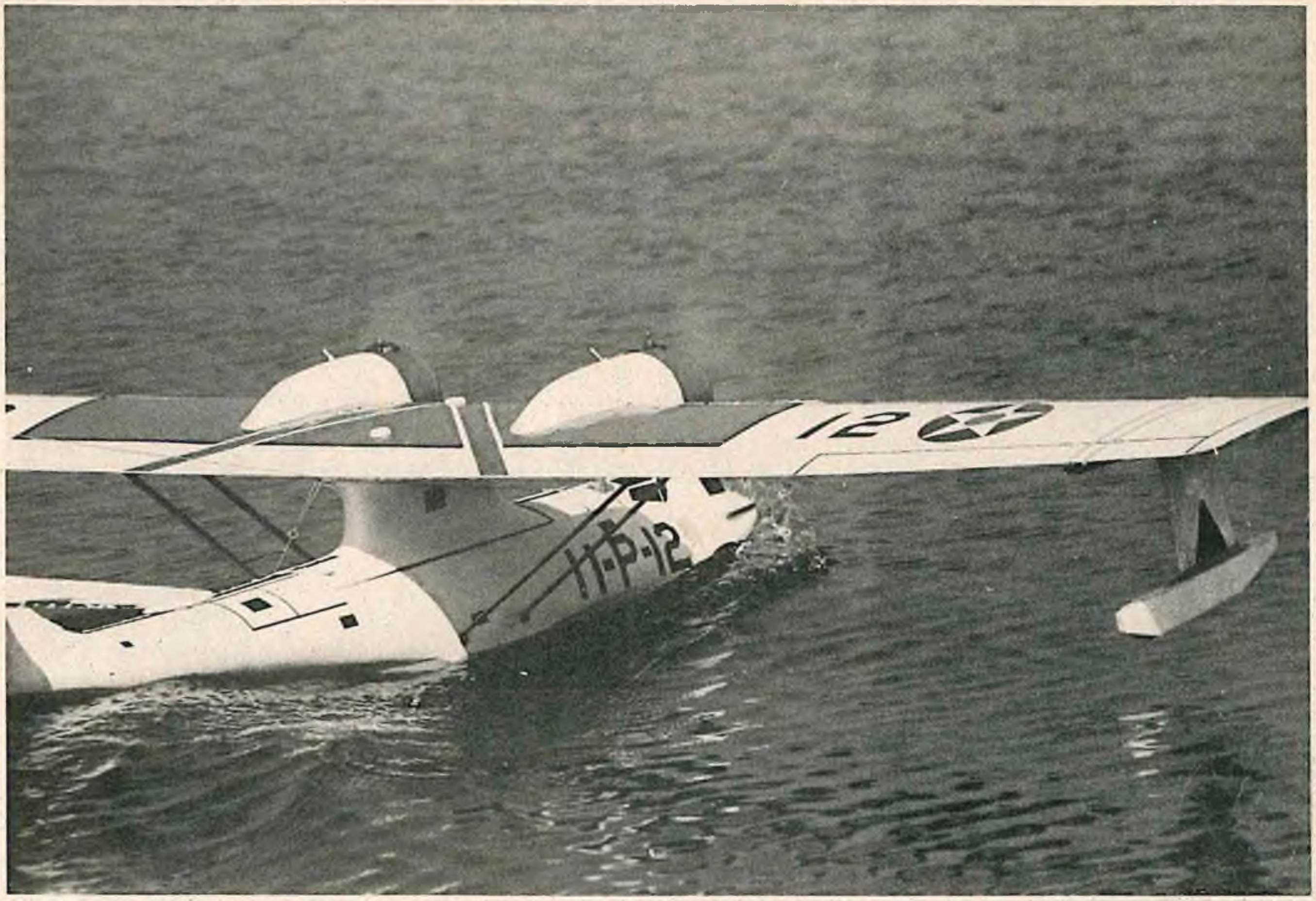
The landing gear greatly increases the model's versatility and permits you to operate it anywhere you might be — on land or water.

Either way, both ways - - - Happy Flying! □

PBY-2 CATALINA
Designed By: Bud Chappell

TYPE AIRCRAFT
Stand-Off Scale Flying Boat
WINGSPAN
66½ Inches
WING CHORD
8¼ Inches
TOTAL WING AREA
520 Square Inches
WING LOCATION
Pylon
AIRFOIL
Mod. Clark Y
WING PLANFORM
Double Taper Outer Panel
DIHEDRAL, EACH TIP
3/4" Outer Panels
O.A. FUSELAGE LENGTH
43 Inches
RADIO COMPARTMENT AREA
(L) 15" X (W) 2½" X (H) 2"
STABILIZER SPAN
21¾ Inches
STABILIZER CHORD (incl. elev.)
4⅝" Average
STABILIZER AREA
88 Sq. In. Approx.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
1/2 Way Up Fin
VERTICAL FIN HEIGHT
7¾ Inches
VERTICAL FIN WIDTH (incl. rudder)
8½" Average
REC. ENGINE SIZE
(2) O.S. Max .10 or .15
FUEL TANK SIZE
(2) 2 or 3 Ounce
LANDING GEAR
Optional
REC. NO. OF CHANNELS
3
CONTROL FUNCTIONS
Rudder, Elevator & Throttle
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa & Ply
Empennage	Balsa & Ply
Weight Ready-To-Fly	80 Oz.
Wing Loading	23 Oz./Sq. Ft.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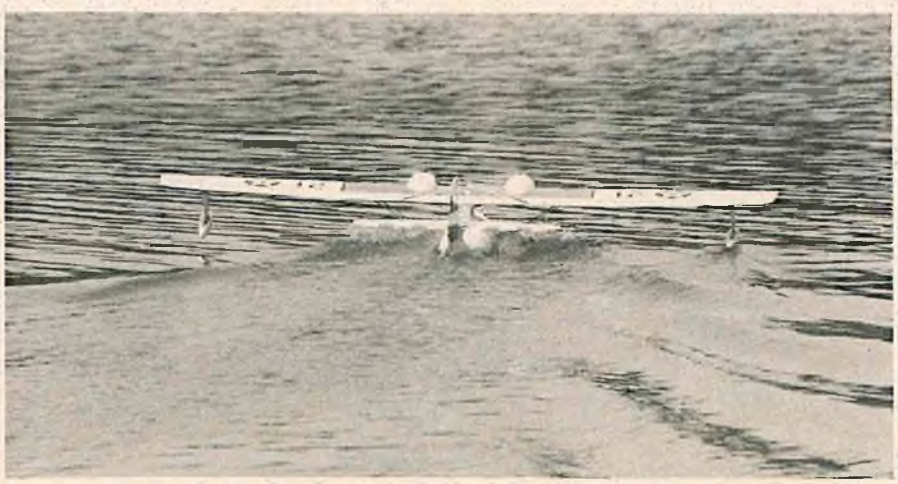


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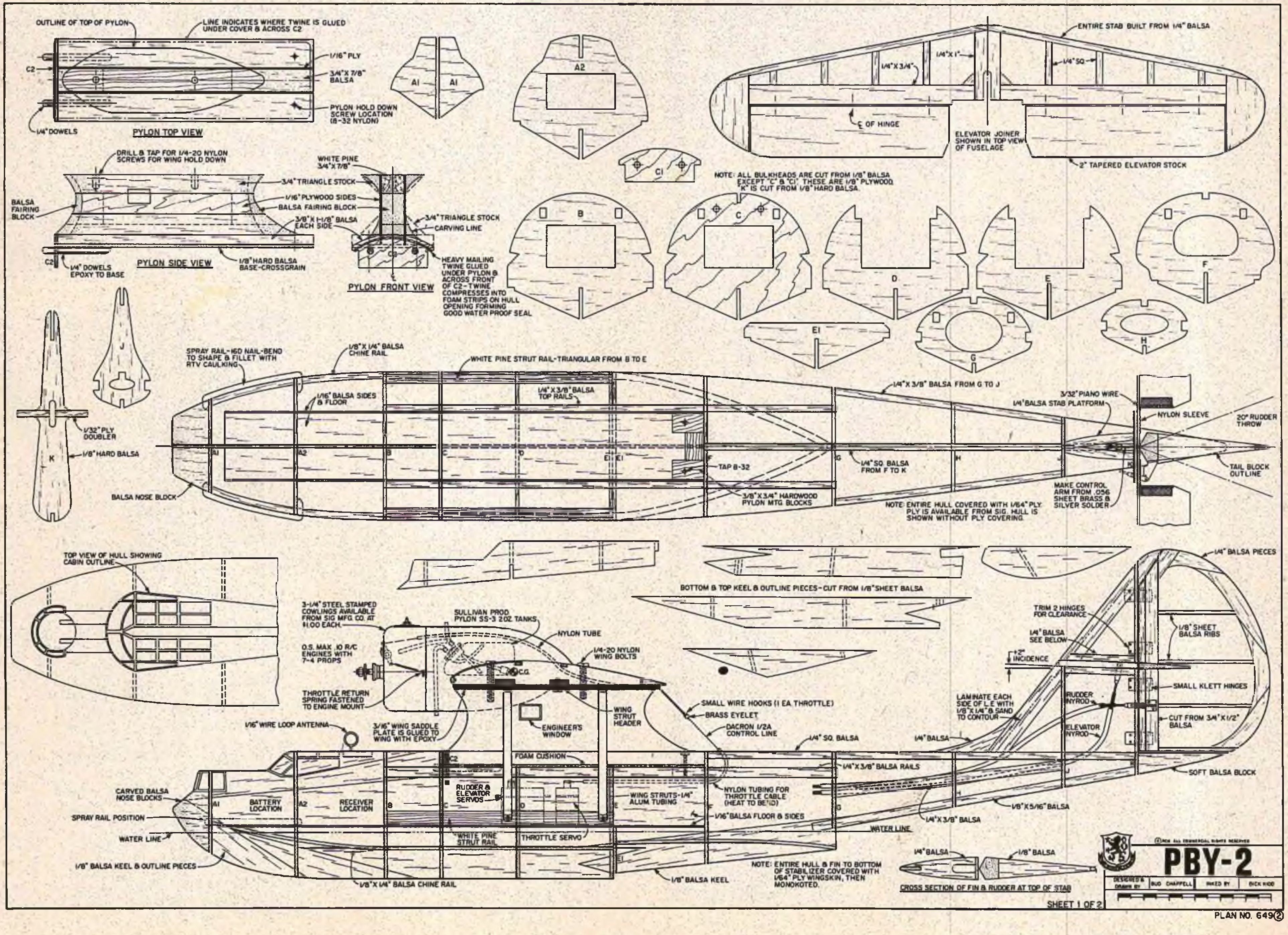
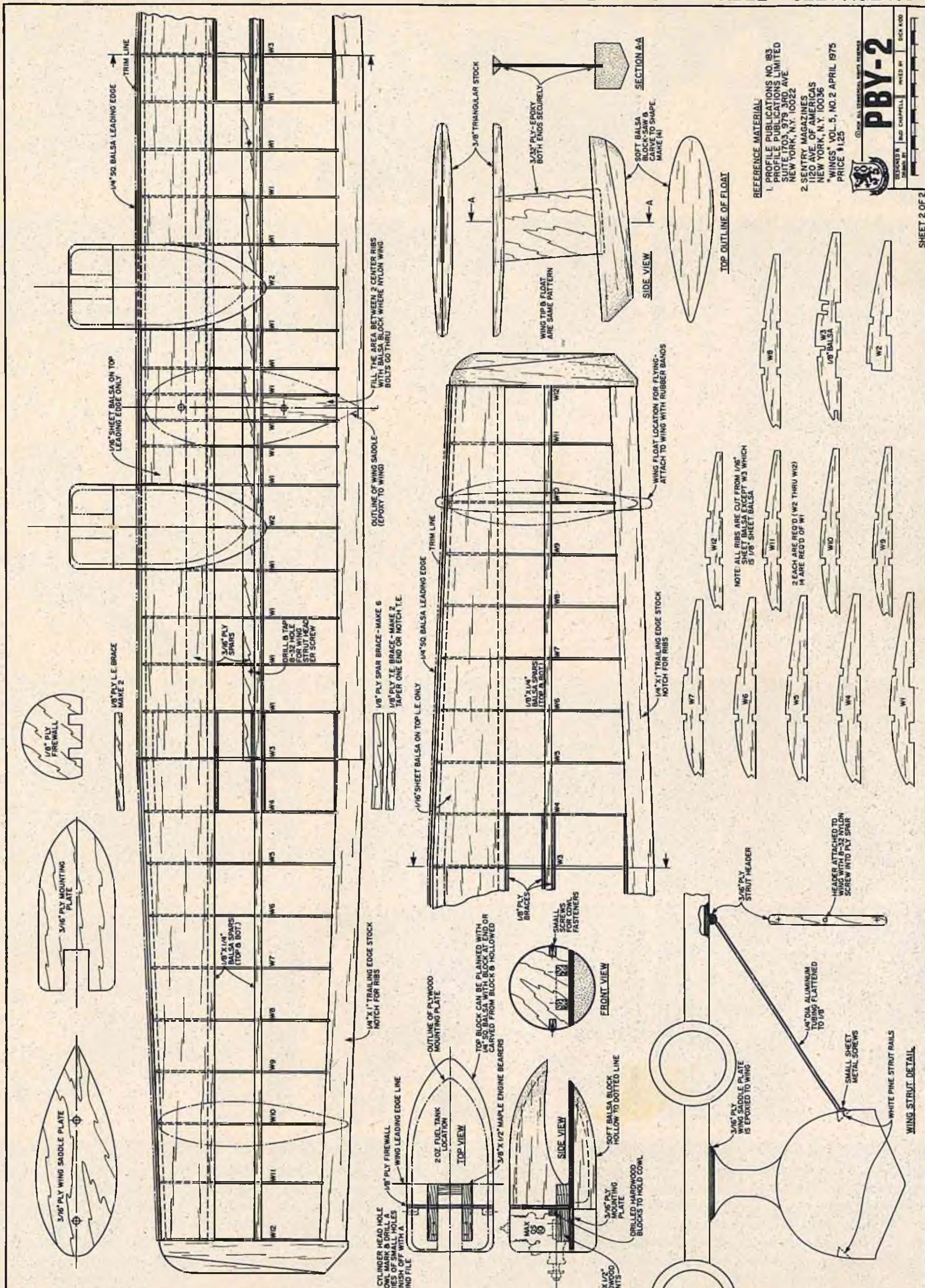
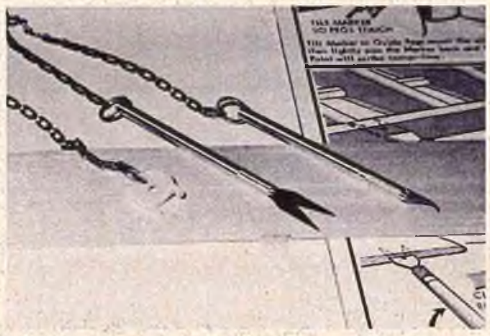

OUTLINE OF TOP OF PYLON
LINE INDICATES WHERE TWINE IS GLUED UNDER COVER & ACROSS C2
C2
1/16" PLY
3/4"X 7/8" BALSA
PYLON HOLD DOWN SCREW LOCATION (8-32 NYLON)
1/4" DOWELS
PYLON TOP VIEW
DRILL & TAP FOR 1/4-20 NYLON SCREWS FOR WING HOLD DOWN
BALSA FAIRING BLOCK
3/4" TRIANGLE STOCK
1/16" PLYWOOD SIDES
BALSA FAIRING BLOCK
3/8"X 1-1/8" BALSA EACH SIDE
1/4" DOWELS EPOXY TO BASE
PYLON SIDE VIEW
1/8" HARD BALSA BASE-CROSSGRAIN
WHITE PINE 3/4"X 7/8"
3/4" TRIANGLE STOCK
CARVING LINE
HEAVY MAILING TWINE GLUED UNDER PYLON & ACROSS FRONT OF C2-TWINE COMPRESSES INTO FOAM STRIPS ON HULL OPENING FORMING GOOD WATER PROOF SEAL
PYLON FRONT VIEW
A1
A2
C1
B
C
D
E
F
E1
G
H
J
K
ENTIRE STAB BUILT FROM 1/4" BALSA
1/4"X 1"
1/4"X 3/4"
1/4" SQ.
℄ OF HINGE
ELEVATOR JOINER SHOWN IN TOP VIEW OF FUSELAGE
2" TAPERED ELEVATOR STOCK
NOTE: ALL BULKHEADS ARE CUT FROM 1/8" BALSA EXCEPT "C" & "C1". THESE ARE 1/8" PLYWOOD. "K" IS CUT FROM 1/8" HARD BALSA.
1/32" PLY DOUBLER
1/8" HARD BALSA
SPRAY RAIL-16D NAIL-BEND TO SHAPE & FILLET WITH RTV CAULKING
1/8"X 1/4" BALSA CHINE RAIL
WHITE PINE STRUT RAIL-TRIANGULAR FROM B TO E
1/16" BALSA SIDES & FLOOR
1/4"X 3/8" BALSA TOP RAILS
BALSA NOSE BLOCK
TAP 8-32
3/8"X 3/4" HARDWOOD PYLON MTG BLOCKS
1/4"X 3/8" BALSA FROM G TO J
1/4" SQ. BALSA FROM F TO K
3/32" PIANO WIRE
1/4" BALSA STAB PLATFORM
NYLON SLEEVE
20° RUDDER THROW
TAIL BLOCK OUTLINE
MAKE CONTROL ARM FROM .056 SHEET BRASS & SILVER SOLDER
NOTE: ENTIRE HULL COVERED WITH 1/64" PLY. PLY IS AVAILABLE FROM SIG. HULL IS SHOWN WITHOUT PLY COVERING.
TOP VIEW OF HULL SHOWING CABIN OUTLINE
BOTTOM & TOP KEEL & OUTLINE PIECES-CUT FROM 1/8" SHEET BALSA
3-1/4" STEEL STAMPED COWLINGS AVAILABLE FROM SIG MFG. CO. AT $1.00 EACH.
SULLIVAN PROD. PYLON SS-3 2OZ. TANKS
NYLON TUBE
1/4-20 NYLON WING BOLTS
O.S. MAX .10 R/C ENGINES WITH 7-4 PROPS
C.G.
THROTTLE RETURN SPRING FASTENED TO ENGINE MOUNT
WING STRUT HEADER
SMALL WIRE HOOKS (1 EA. THROTTLE)
BRASS EYELET
DACRON 1/2A CONTROL LINE
1/16" WIRE LOOP ANTENNA
3/16" WING SADDLE PLATE IS GLUED TO WING WITH EPOXY
ENGINEER'S WINDOW
FOAM CUSHION
CARVED BALSA NOSE BLOCKS
SPRAY RAIL POSITION
WATER LINE
1/8" BALSA KEEL & OUTLINE PIECES
BATTERY LOCATION
RECEIVER LOCATION
RUDDER & ELEVATOR SERVOS
WHITE PINE STRUT RAIL
THROTTLE SERVO
WING STRUTS-1/4" ALUM. TUBING
1/8"X 1/4" BALSA CHINE RAIL
1/16" BALSA FLOOR & SIDES
NYLON TUBING FOR THROTTLE CABLE (HEAT TO BEND)
1/4" SQ. BALSA
1/4"X 3/8" BALSA RAILS
1/8" BALSA KEEL
1/4"X 3/8" BALSA
1/8"X 5/16" BALSA
WATER LINE
NOTE: ENTIRE HULL & FIN TO BOTTOM OF STABILIZER COVERED WITH 1/64" PLY WINGSKIN, THEN MONOKOTED.
1/4" BALSA PIECES
TRIM 2 HINGES FOR CLEARANCE
1/4" BALSA SEE BELOW
1/2° INCIDENCE
1/8" SHEET BALSA RIBS
SMALL KLETT HINGES
LAMINATE EACH SIDE OF L.E. WITH 1/8"X 1/4" & SAND TO CONTOUR
RUDDER NYROD
ELEVATOR NYROD
CUT FROM 3/4"X 1/2" BALSA
1/4" BALSA
SOFT BALSA BLOCK
1/8" BALSA
CROSS SECTION OF FIN & RUDDER AT TOP OF STAB
PBY-2
DESIGNED & DRAWN BY BUD CHAPPELL
INKED BY DICK KIDD
SHEET 1 OF 2
PLAN NO. 649②

FULL SIZE PLANS AVAILABLE — SEE PAGE 195









1ST ROW: (L) Toledo R/C Exposition co-directors Don Belote and Bob Hisey with Miss Dorothy Rade. (C) Stephen J. Sauger won Best of Show Award with his fantastic 1948 Stinson Voyager. (R) Stephen Sauger's Stinson Station Wagon. 2ND ROW (L) Buford Gross presented last year's Best of Show Winner, Wright Flyer, to the AMA Model Museum. (C) Cannon Electronics 4 ½ ounce radio was the hit of the show. (R) Cannon's servo motor on left compared with quarter and normal servo motor at right. Four channel receiver electronics and servo shown above. 3RD ROW: (L) House of Balsa introduced a line of .049 powered Stand-Off Scale kits. (C) Carl Goldberg Models hinge installation tools are items that every R/C modeler need. (R) Ace R/C will have Aero Commander kits for .049 engines available by mid-summer. 4TH ROW: (L) Convair Pogo VTOL kit is produced by Steve Snyder Enterprises, Inc. (C) Brown Special is the latest of Bridi Enterprises kits. (R) Douglas DC-3 (or C-47) fiberglass and foam kit is the first of a series of multi-engine kits being prepared by Sure Flite Products. 5TH ROW: (L) We were hooked by Sure Flight Products Hooker sign! (C) Hobby World's Vertigo II pattern ship for the hot competition. (R) Top Flite's P-47 is ready for the market place.

1ST ROW: (L) Rhom-Air showed their electric fuel pump that screws into a gallon can. (C) Linda Andrae of Wing demonstrated their vacuum-forming machine – a good club item. (R) Custom Craft has a neat tool for making true wing joints. 2ND ROW: (L) Hobby Lobby is distributing the sturdy precision Micro Lathe by Taig. (C) A versatile line of motor mounts by Edson Enterprises. (R) Liquid masking film from Fliteglas Models has unlimited applications for trimming your model. 3RD ROW: (L) Robart has a clever steerable retractable tail wheel. (C) JP Products has what you need for making scale instrument panels. (R) Wing Wedge is a handy new field item. 4TH ROW: (L) AP announces their new glow plugs and fuel blends. (C) Bridi Enterprises has a new line of motor mounts. (R) Futaba's new radio has many exciting features. 5TH ROW: (L) The ultimate in sophisticated R/C systems is the Kraft Signature Series which is personally supervised by Steve Helm. (C) An electric throttle is one of the electronic items by Simcoe Model Manufacturers from Canada. (R) An expanded scale voltmeter by Craft-Air.

1ST ROW: (L) Sonic Tronics has a new engine starting aid. (C) Radio systems by Westport International have new interference rejection features. (R) Thermic Sniffer is a rate-of-climb sensing device for sailplanes. 2ND ROW: (L) The Glo Bee power pack fastens to the side of your field box. (C) The Fuji engines are an economical line of engines for the sport flyer distributed by Hobby Shack. (R) Peri-Pod by Blue Water Crafts, Ltd., is a new concept for launching sailplanes. 3RD ROW: (L) Prather Products customized ST-X40 has proven itself in pylon racing. (C) OPS high performance engines are available from Shamrock Competition Imports. (R) World Engines displayed the new O.S. four-cycle .60. 4TH ROW: (L) MAC's Heloball Silencers for helicopters is an effective expansion chamber. (C) MRC-Webra power plants for aircraft and boats have been big in the winners circle. (R) Aristo-Craft has casting kits for steam engines. 5TH ROW: (L) Aristo-Craft is importing 5 and 7 cylinder four-cycle radial engines from England. (C) Scozzi ducted fans have been used in some spectacular projects by NASA. (R) Cox displayed their engine line, including their new .15 and .40.

1ST ROW: (L) R. Shettler Enterprises has a 2 c.i. engine for the large models. (C) The NRCHA was pushing national helicopter activity. (R) This twelve foot span Martin PBM is made of foam and was shown with movies of it in flight. 2ND ROW: (L) An impressive pair of one-third scale Pitts S-2-A. (C) VK has a beautiful line of accessories for WW I models. (R) Ace RC's accessories for Half-A activity continues to expand. 3RD ROW: (L) RS Systems radios are now being produced on the East Coast. (C) Electronic equipment from DAE Products. (R) Flite Lite will let you know when your battery pack is too low to safely fly. 4TH ROW: (L) Sky Glas Fabrications will have kits with a fiberglass hull for this river boat. (C) A typical example of the many high performance power boats displayed. (R) Staubitz of Buffalo produces fiberglass naval ship models. 5TH ROW: (L) Interest in R/C sailboats is growing rapidly. (C) The complexities of winning power boats are shown on this model by Marine Specialties. (R) Octura has been a long time leader in boat propellers and accessories.

RADIO SPECTRUM

BY JIM ODDINO

● Last month we talked a little bit about transmitter power and how it affected range, and we made a statement to the effect that, theoretically, you could operate at distances relatively large, compared with those at which we fly our model planes, with as little as 180 milliwatts of transmitter power. There are a number of things that degrade this theoretical performance and an understanding of these factors might help you overcome some problems you might be encountering.

Two factors that degrade the theoretical performance are the efficiency and beam patterns of the antennas. A half wave dipole would make a very efficient antenna but would be rather cumbersome. A compromise is to use a grounded quarter wave antenna which would cut the length in half.

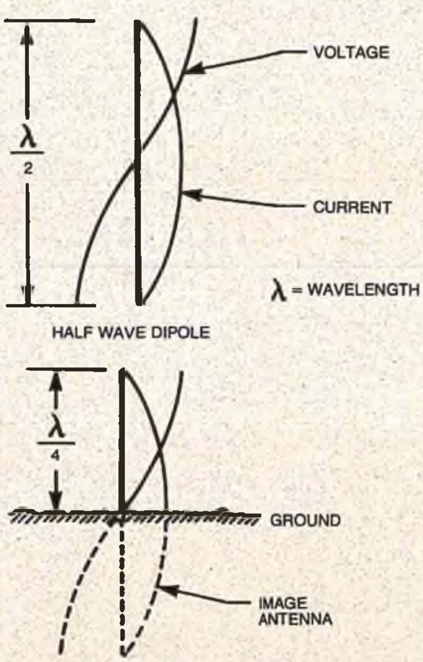


FIGURE 1

Our base loaded monopole, or unipole, antennas are not actually grounded and are probably a further compromise. It is difficult to develop a precise analysis for these antennas, but if we just assumed that we had a grounded antenna system we can see the degradation when compared to the half wave dipole. To understand the operation of the grounded antenna, refer to Figure 1. It shows the current and voltage relationships of a half wave dipole and a quarter wave grounded antenna. The earth acts as an electrical mirror and the missing half of the antenna is supplied by the image.

The directional characteristics of the grounded quarter wave antenna will be similar to those of a half wave antenna in free space. A vertical antenna has a circular radiation pattern in the horizontal plane which is good because the radiation is the same in all directions, but in the vertical plane, the radiation will decrease from maximum along the ground to zero directly overhead. This is shown in Figure 2.

The length of the arrows represents the relative field strength in that direction. The grounded antenna may be shorter than a quarter wave and still be made resonant by "loading" it with an inductance at the base, so don't get excited if your antenna is less than a quarter wave length long. However, the effieiceny of the antenna is the ratio of the radiation resistance to the total resistance of the system. The total resistance includes resistance in conductors and dielectrics, including loading coils and the resistance of the grounding system. The half wave antenna is very efficient because the conductor resistance is negligible compared with the radiation resistance. In the case of the grounded antenna, the ground resistance is not neglible. Without an elaborate grounding system, an impossibility with our hand-held transmitters, the efficiency is not likely to exceed 50 percent and may be much lower if the antenna is much shorter than 1/4 wave length.

One analysis of base loaded monopole antennas suggests that the transmitter case and not the earth provides the other element in an asymmetrical dipole configuration. This would mean the ground resistance problem would disappear but the efficiency would still suffer when compared to the symmetrical dipole.

In any case, our antennas aren't so efficient and they are directional in the vertical plane; what can we do about it? We can't do much about the efficiency unless we use a half wave dipole or are willing to plug into some kind of grounding system which isn't too appealing. However, the manufacturer can get the radiated power up by increasing the power out of the transmitter into the antenna and accepting the poor antenna efficiency. Given that, you have a transmitter with a certain output power and antenna efficiency you can improve performance by the relative orientation of your transmitter and receiver antennas.

Fig. 2 shows that you radiate maximum field strength perpendicular to axis of your antenna so you never want to point the end of antenna at the airplane. Receiver antenna has similar directional properties.

The worst condition you can get into is to have the two antennas pointing at each other, a case which is common when the antenna on the airplane is fairly horizontal (tied to the rudder), the airplane is at a relatively low angle (either at low altitude or a long way out), and the transmitter is held with the antenna horizontal to the ground.

The fixes should be obvious. Put a vertical whip on the airplane, don't fly too far out or too low and keep your transmitter antenna vertical. You've seen some of these suggestions put into practice by Europeans such as Hanno Prettner and Wolfgang Matt who usually sport vertical whips on their planes and have transmitter antenna arrangements such that the antenna is fairly vertical, even though the transmitter box is horizontal.

There are other reasons for not flying out

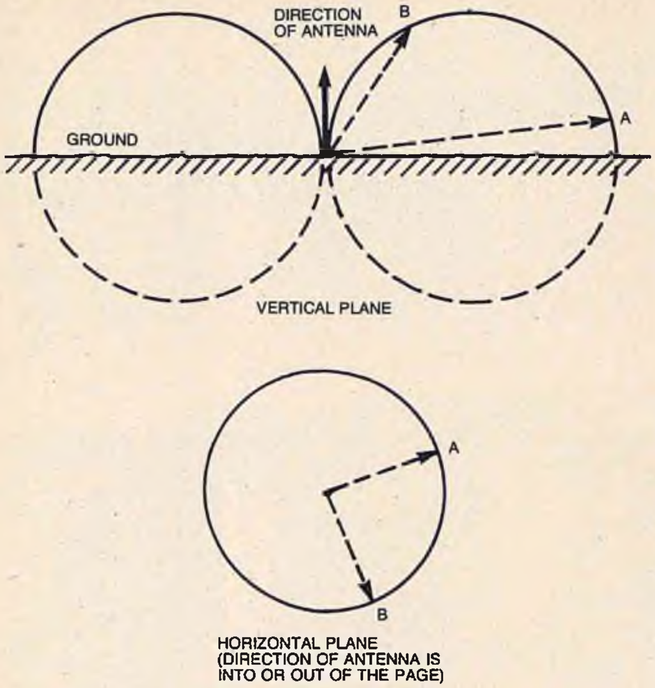


FIGURE 2

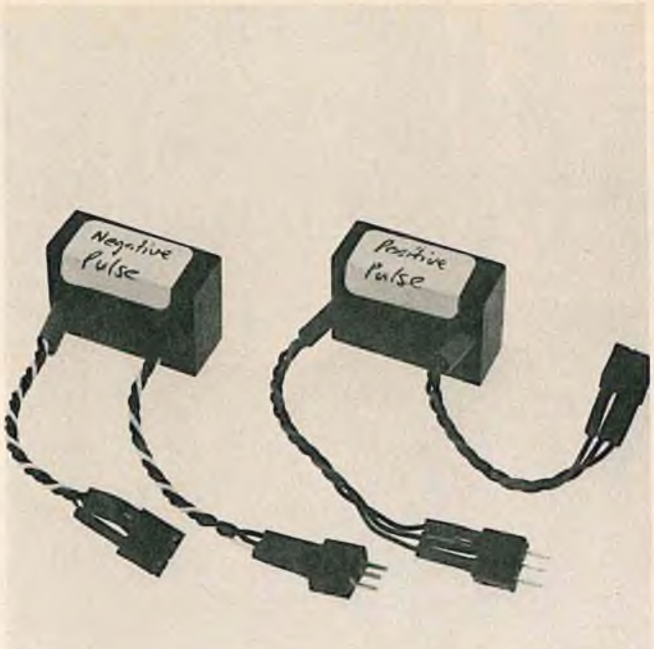


PHOTO 2: Quantizied Controls Servo Reverser shown for negative and positive pulse systems. Unit reverses servo direction without appreciable drift with voltage.

too far when you are down low. The attenuation of a wave that travels in contact with the earth's surface is rather high so the intensity dies off rapidly with distance from the transmitter. The antenna pattern shown in Figure 2 ignores this and represents relative intensities if the antenna were in free space. There is also a larger chance for the reflected wave to cancel out the direct wave, causing a null when you are down low.

Most manufacturers have attacked this problem by increasing transmitter power and my experience indicates that a half watt is completely adequate to give a fairly large safety factor so the modeler doesn't have to worry about all these things. RC Manufacturing advertised a system with an antenna that resembled a large handle on the transmitter. Theoretically this type of antenna has no direction in which the radiation is zero, so it should alleviate the problem but, then again, the real world whip antenna doesn't really have zero radiation in the direction straight off the end either.

SK Products DC to AC inverter delivers a 3 volt peak-to-peak square wave to the glow plug which is equivalent to 1.5 VDC.

Westport International is advertising a four watt transmitter which you would say has to be better than a half watt transmitter which has to be better than the 180 MW transmitter. However, once again, if the low power transmitter is doing the job, the increase in power will buy you nothing. And when one considers the other subject we talked about last month, namely spurious responses, I'm afraid that increased transmitter power is going to make life more complicated. The spurious responses are most prevalent with large signals into the receiver and more transmitter power means more power must be handled by the receiver. I suspect we haven't heard the last of this subject.

In summation; don't go out and throw your present RC equipment away if it has been doing the job, or go buy a system that has a "crooked" antenna coming out the transmitter, but recognize that your antenna was designed to operate vertically and that it is somewhat directional. If you get in a weak signal area or lose sensitivity for any reason, get that antenna vertical and get the plane up high. Get back to the field at a safe altitude and make a fairly steep approach for landing. If you continually have trouble, consider a transmitter with a higher output power, or vertical whip on the airplane.

• •

There has been a lot of discussion concerning conductive plastic feedback potentiometers in our servos. From ads you would think this is that answer to everyone's problems. However, it should be noted that some manufacturers have gone back to the conventional carbon pots even after the big advertising binge. My own personal experience with the conductive plastic pots has been good, but I have seen them do poorly in planes with high vibration levels. In fact, the carbon seem to do better in this environment, and their use seems to be justified. This discussion, once again, points out the need to keep the vibration out of the pot. I'm not sure I emphasized it when we talked about reliability a few months back, but we've really got to watch what we do with these modern day engines that are developing so much power. We have found that the best engine mounts are the aluminum type made by Fox, CB and others, bolted to heavy firewalls that are at least 3/8" thick. This configuration seem to be better than the built-in wooden mounts found in some fiberglass fuselage kits. It's been a long time since I've had a wooden fuselage, so I can't comment on them, but I suspect the same is true. Everyone is paying more attention to balancing props nowadays with the high rpm engines, but don't foreget that spinner. The best bet here is one with a turned metal back plate such as the Fox, CB, and Midwest spinners. So give your servos a break and do something about that buzz in your airplane that stings your hand and makes your glow plug appear blurred!

• •

Well, we've got lots of interesting letters and products to discuss this month, so let's get started.

Dear Mr. Oddino,

I just finished reading you column in the April issue of RCM and I would like to make the following comments about Mr. Sullivan's feelings regarding the tapping of

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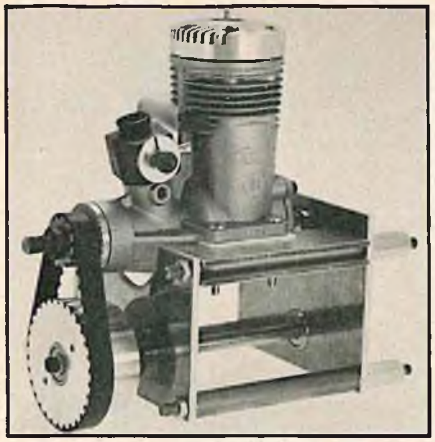
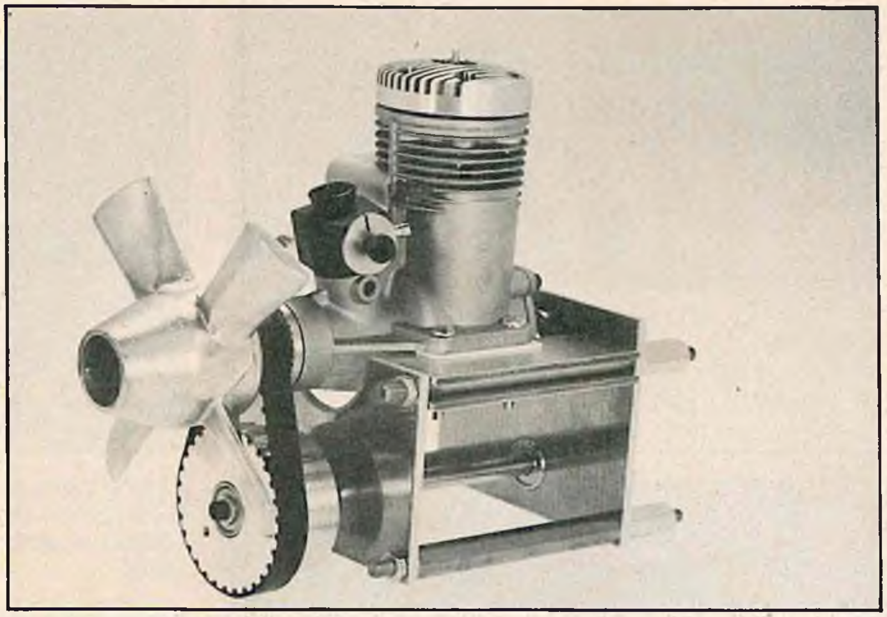
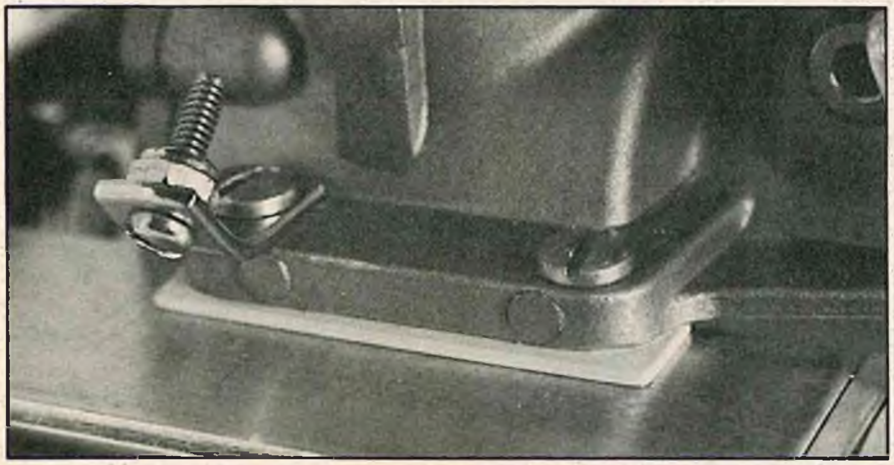
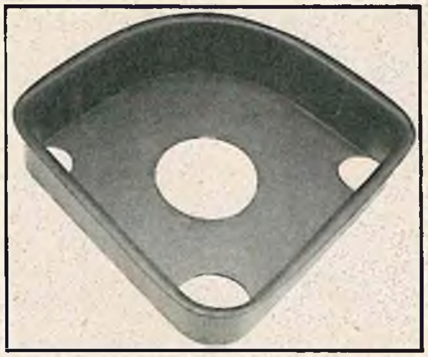
ALL
AMERICAN
'76



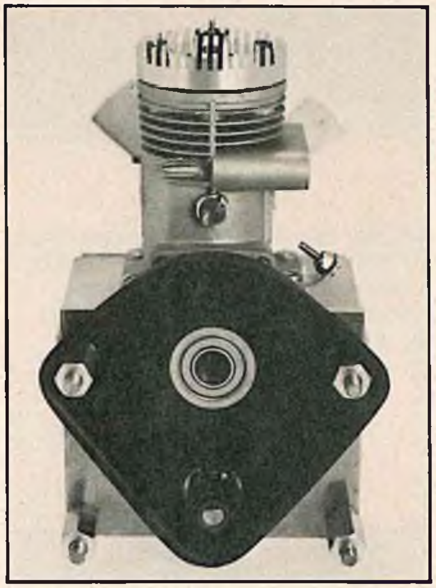


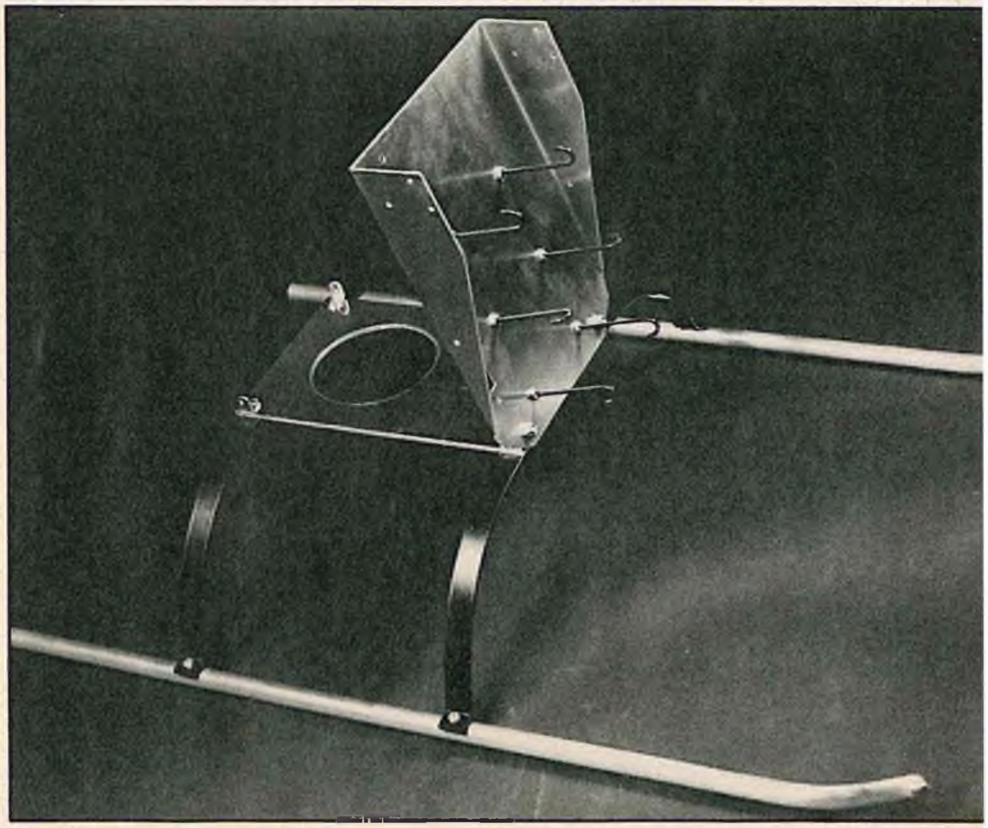
ABOVE: The K & B .61 installed on frame with belt in place. Belt should deflect 1/16" with 1 lb. pressure for proper tension. RIGHT: Cooling fan is installed.



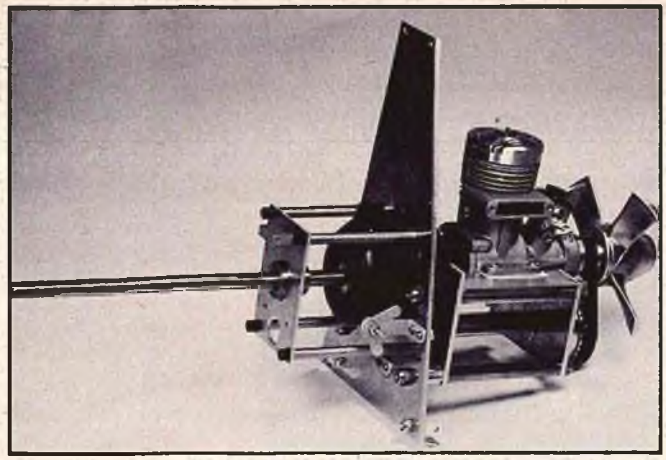


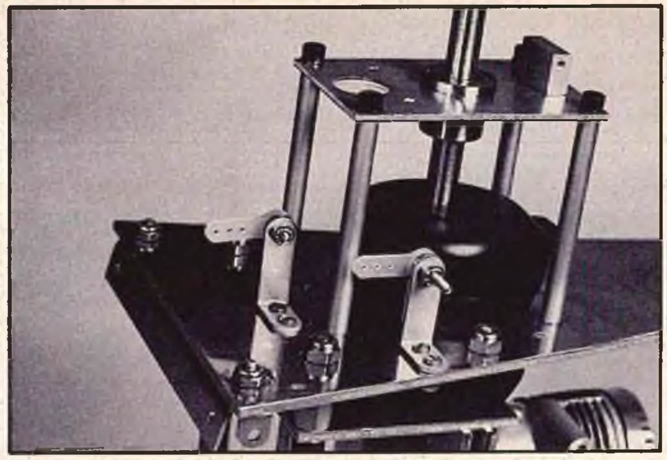
Belt tension spacer under motor lugs and throttle tube guide shown at left. Cut-outs made in gear cover above.



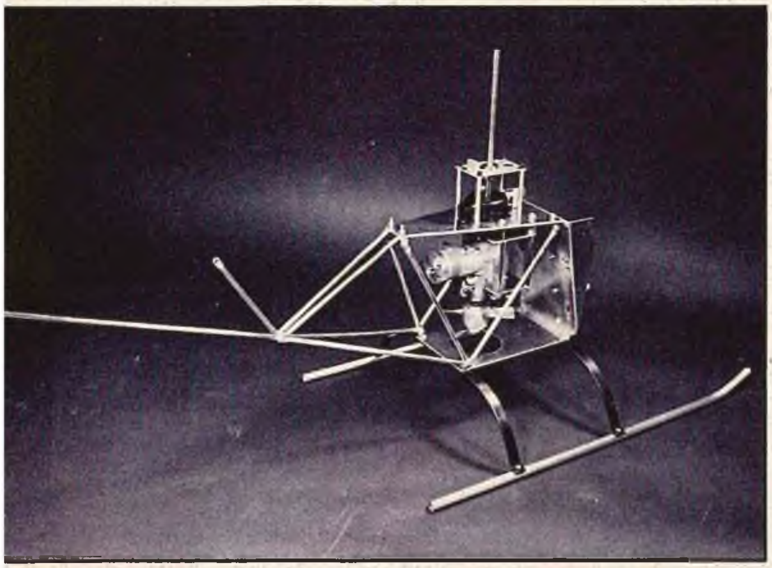


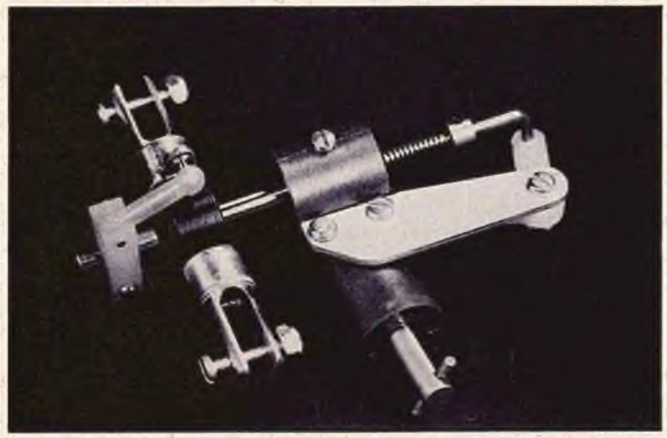
ABOVE: The gear cover is installed on engine frame. Previously drilled holes clear bearing, pinion gear, and motor mount threaded shafts. RIGHT: Basic frame assembly with skids and braces attached. Note positioning of hook ends.

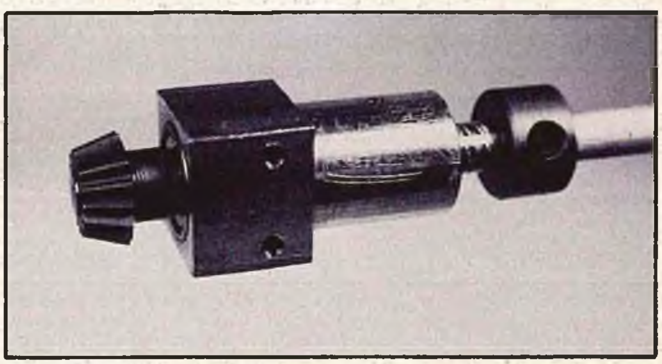




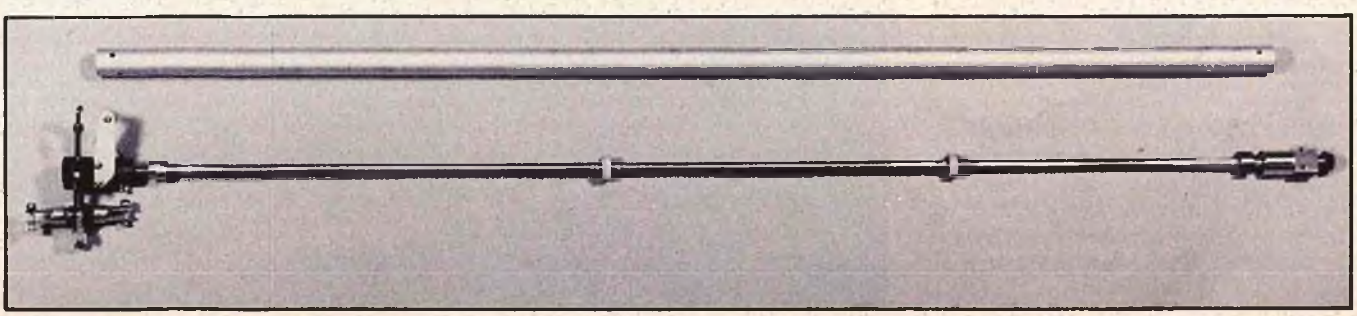
ABOVE: View of completed drive train and bellcrank installation. LEFT: Drive train installed in basic framework. BELOW: Completed tail rotor gear box and pitch change assembly.

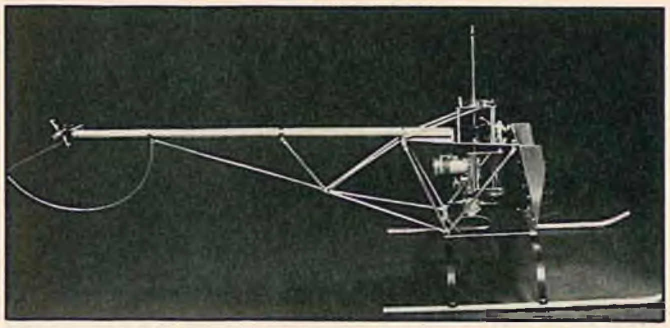




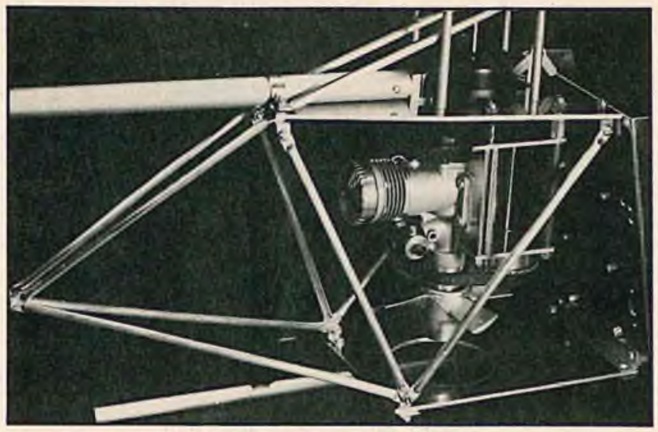


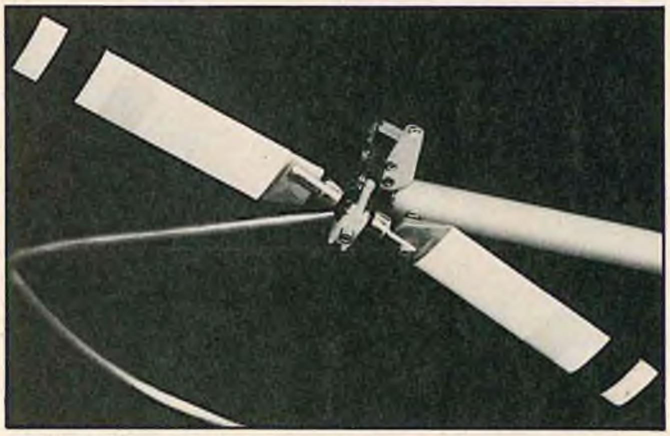
ABOVE, LEFT: Tail rotor gear box drive connector soldered to brass drive shaft. ABOVE: Close-up of one of two teflon bearings soldered to drive shaft. Use 1/16" thick balsa spacers on each side of teflon bearing as soldering aid. LEFT: Front bearing block and gear fitted to drive shaft. BELOW: Completed drive shaft and tail boom ready for installation.



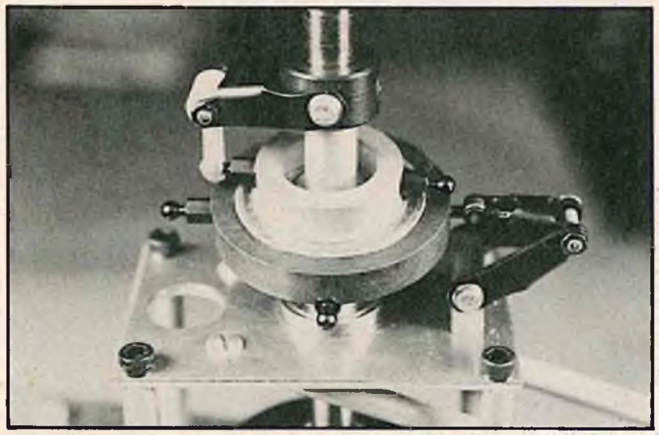


The completed helicopter mechanics ready for radio installation. Note boom attachment and bracing.

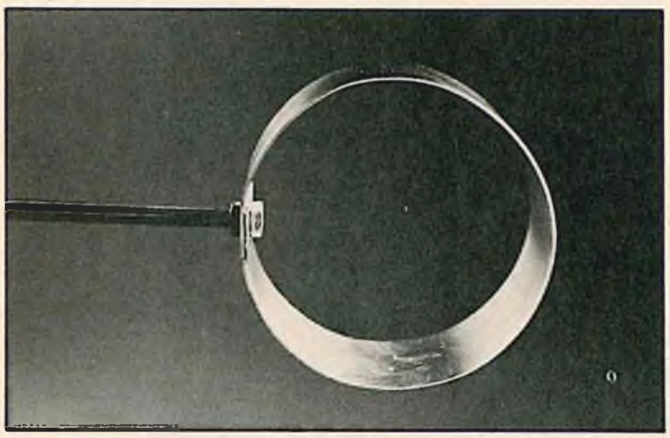


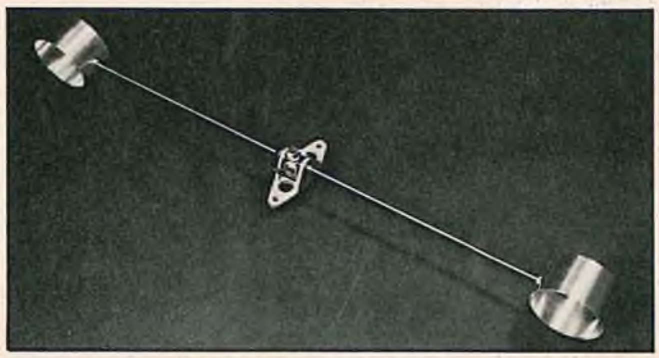


Completed tail rotor assembly attached to tail boom.

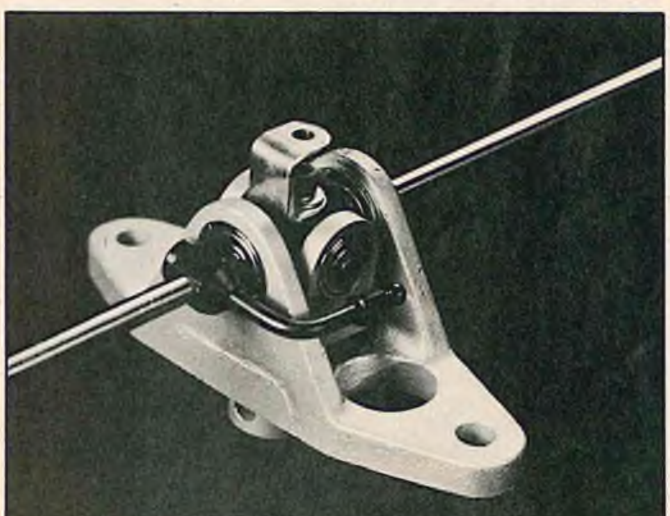


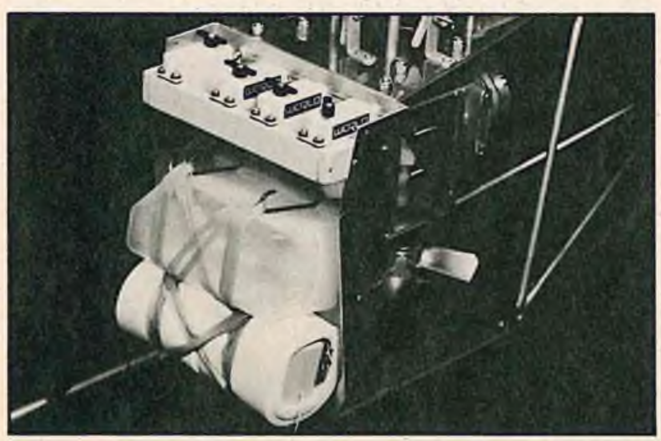
Swash plate with driver and anti-rotation scissors.



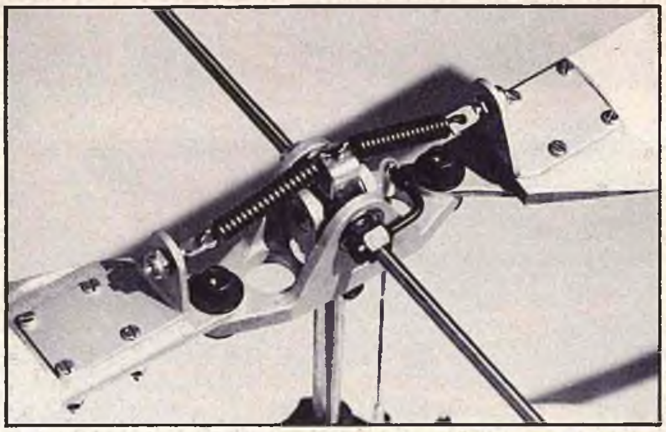


Close-up of control "can" and overall view of cans mounted to flybar.

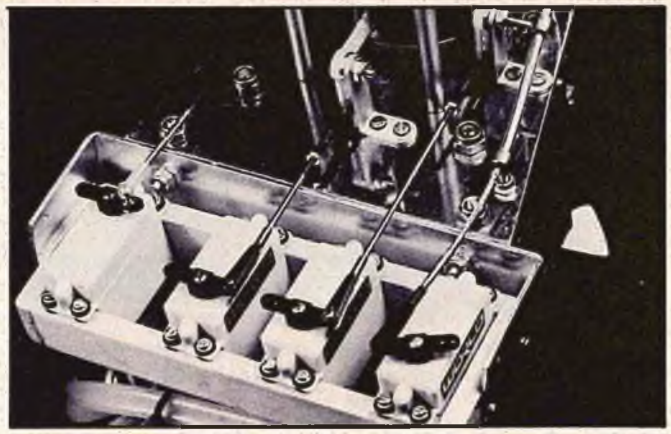




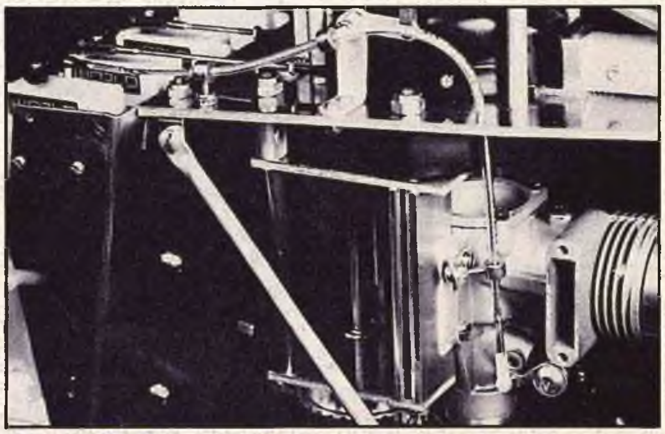
LEFT: The completed head, ready for rotor blade installation. ABOVE: World Engine's Expert servos in tray. Receiver and battery wrapped in DJ's self-adhesive Pro-Tac.



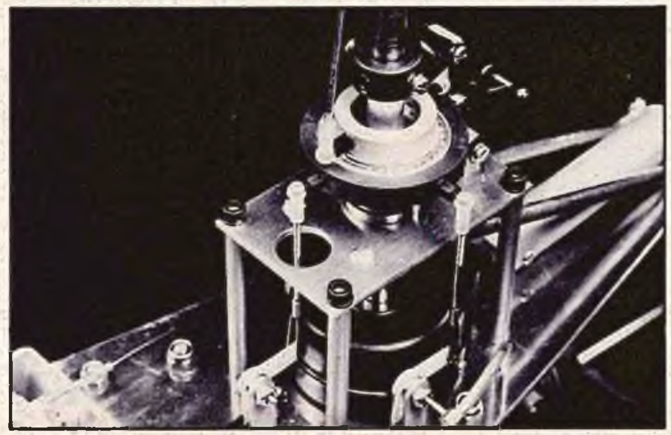
Close-up of completed head assembly.



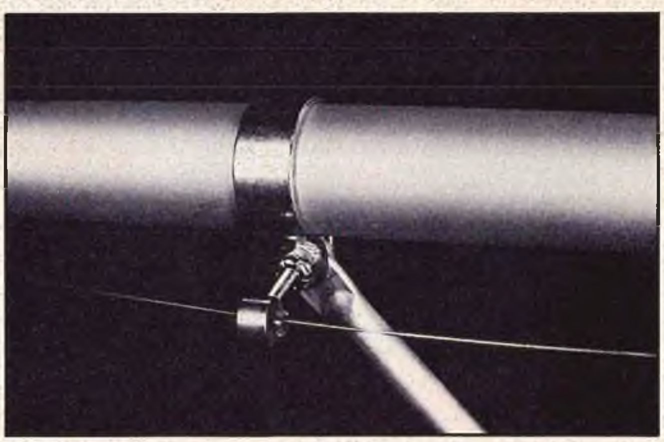
Servos connected to tail rotor, engine, and bellcranks.



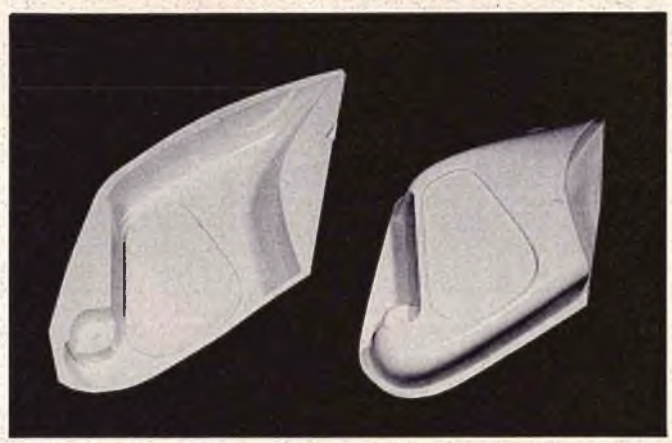
View of throttle cable routing.



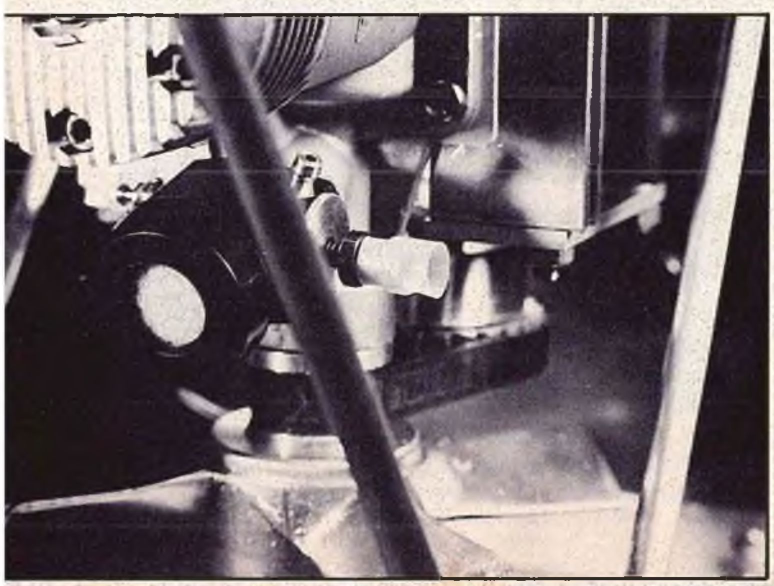
Bellcranks connected to swashplate.



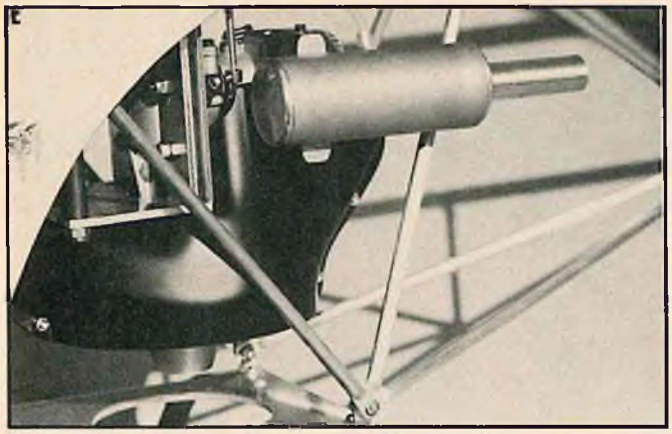
Tail rotor control wire stand-off and guide.



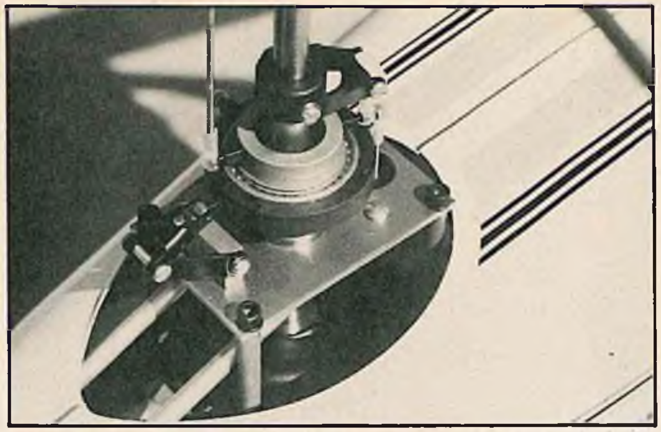
Plastic body shells before trimming and assembly.



LEFT: Perry Air Filter installed on K & B .61. Slotted extension soldered to needle valve with heat shrink guide for screwdriver adjust. ABOVE: Plastic cooling shroud in place.



Semco muffler installed on K & B .61.



View of body cut-out around top plate.

TOP, CENTER: One of the completed RCM Shark .60's. LEFT AND ABOVE: Here's what it's all about, and what the Shark .60 does best – flying! Grady Howard doing his thing with his "All American '76."

● The Sundancer sailplane design was conceived to do many things well. It is a high performance, ruggedly good looking, economical and easily built Standard Class sailplane. The design uses a maximum performance airfoil with a speed range as broad as you will find anywhere, and can operate at low Reynolds numbers to take advantage of the low overall weight. Speaking of weight, how's 26 oz. with 7 oz. of radio included?

The fuselage design takes advantage of the pod and booms low drag characteristics. Turning performance is where the low drag figure shows up best as maneuvers with this model are crisp and accurate. Thermal turns are tight and flat while speed is maintained.

The wing has an aspect ratio of 16:1 with a thin undercambered airfoil and polyhedral. The airfoil performs well at light and medium wing loadings and has a broad speed range not found in most undercambered foils. "D" tube construction is used with spruce spars and leading edge resulting in a strong warp free wing.

The horizontal stabilizer has generous area and a lot of travel to provide positive control in the pitch plane. The Warren Truss design is easily constructed and fairly resistant to warping. The hinging mechanism provides smooth operation with easy field assembly, tear-down and storage without disturbing any control linkages. Another feature of the mechanism is that the elevator is securely positioned in all normal flight maneuvers, but if you have a hard landing the surface falls out unloading the control system which minimizes damage.

The generous use of spruce and plywood and just plenty of beef in the pod makes this plane stand up to punishment that would crumble many. The wing uses spruce structural members for impact resistance and torsional strength. The finish of the fuselage is important to ruggedness also. Glass and resin are hard to beat as they provide the most armor plate for the weight you can get.

The materials used are all standard lengths and thicknesses. All the blocks can be obtained in kits of assorted blocks sold in most hobby shops for about 89¢. The wing ribs are probably the toughest task of the whole project. I use the template method to carve out the set of ribs in a block and it works like a charm. Using blocks in the pod is the easiest method of making compound curves with minimum filling. The prototype has no filling material used in its construction.

To sum it up, the Sundancer represents a year's development effort aimed at making a truly competitive Standard Class soarer. It is light for good thermal performance and super sleek for minimum parasitic drag which gives an extra broad speed range for good penetration and slope soaring. The "trick" airfoil is nine percent thick and gives good lift in light air, while it does not get draggy in stiff conditions. The result of all these design innovations is a high performance Standard Class sailplane that is extremely light, surprisingly strong, and easy to build.

CONSTRUCTION

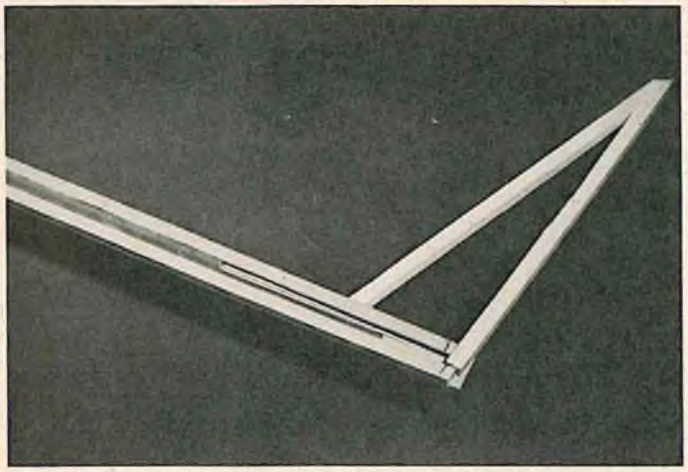
Now, let's get to the actual building process for the Sundancer. The stylized plans are layed out to complement the text of this article so what you don't find on one should be found on the other. Most everything is built right on the plans where

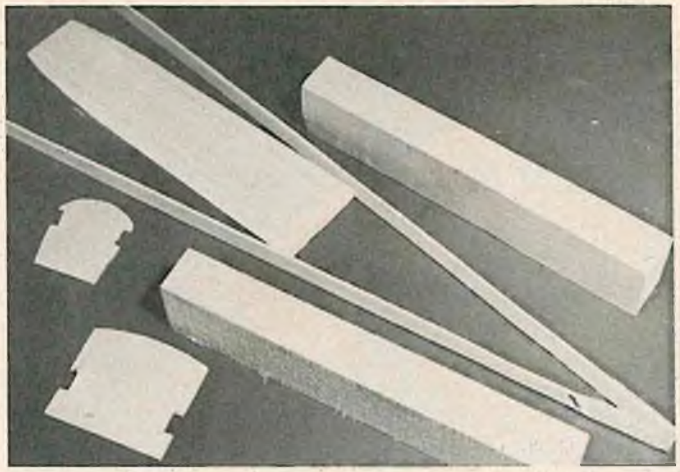
text to page 152

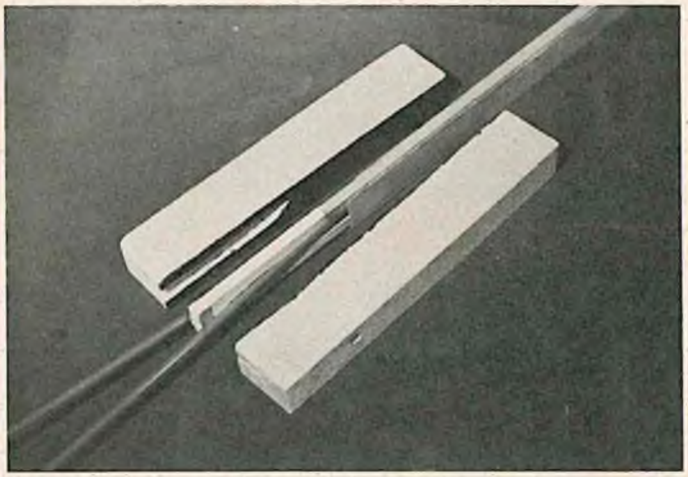
A rugged, easy-to-build Standard Class sailplane that combines economy with maximum performance for the sport or competition flyer.

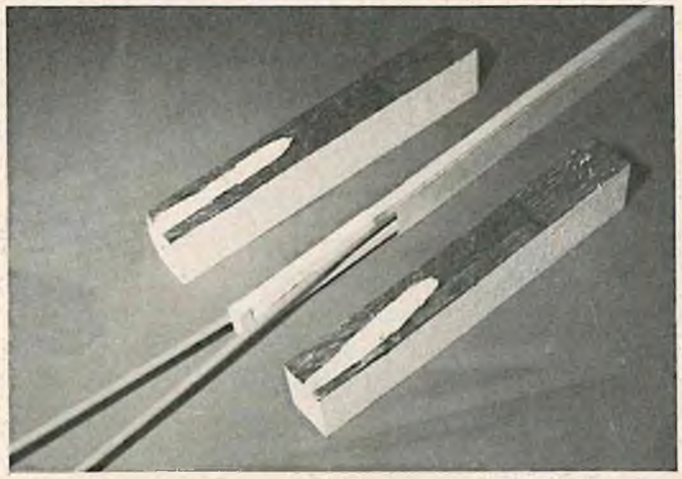
By Robert Dellacamera.

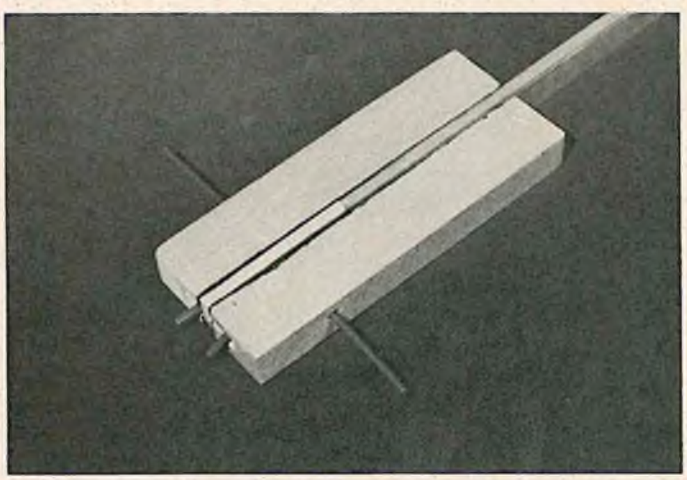
SUNDANCER

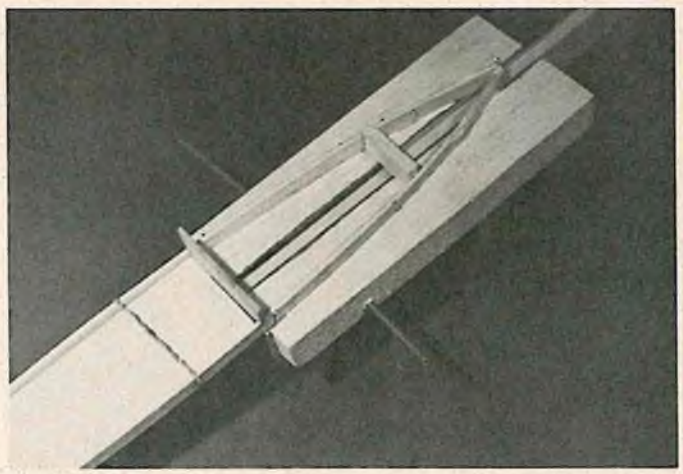


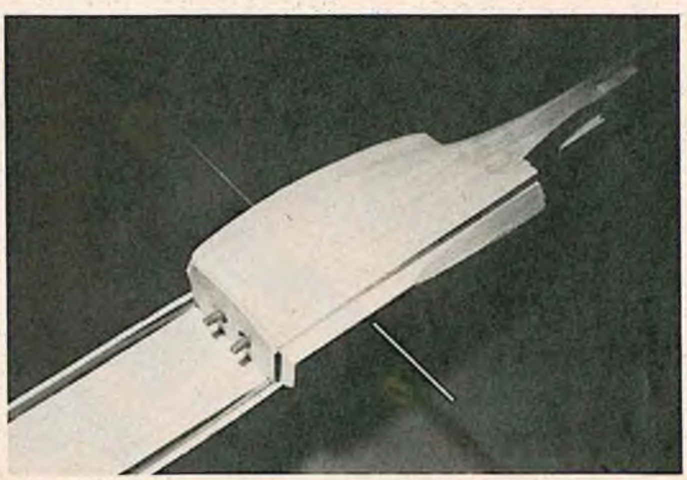




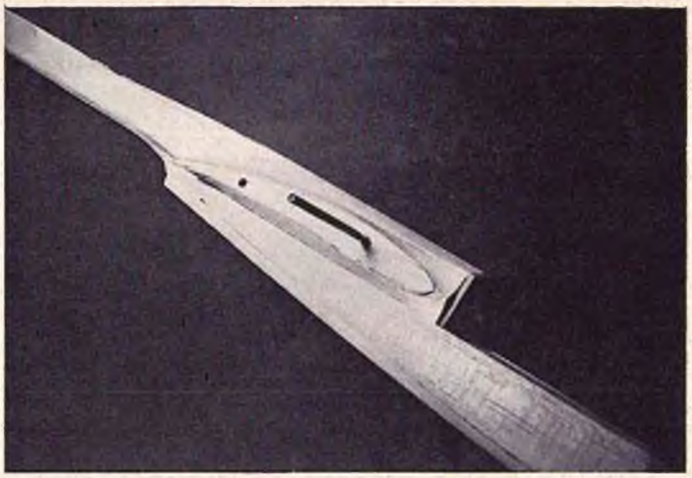


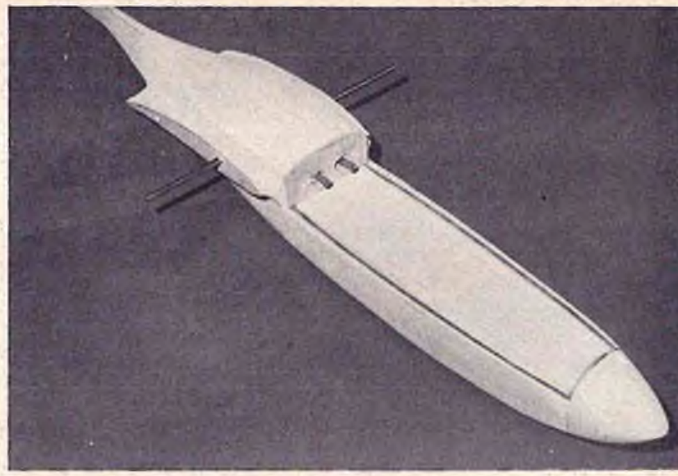




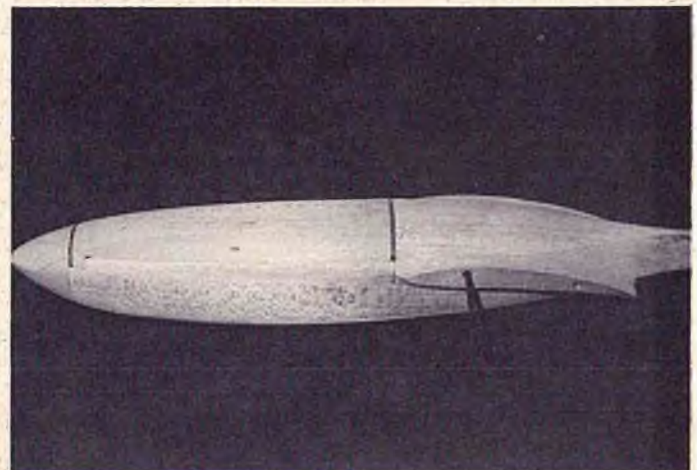


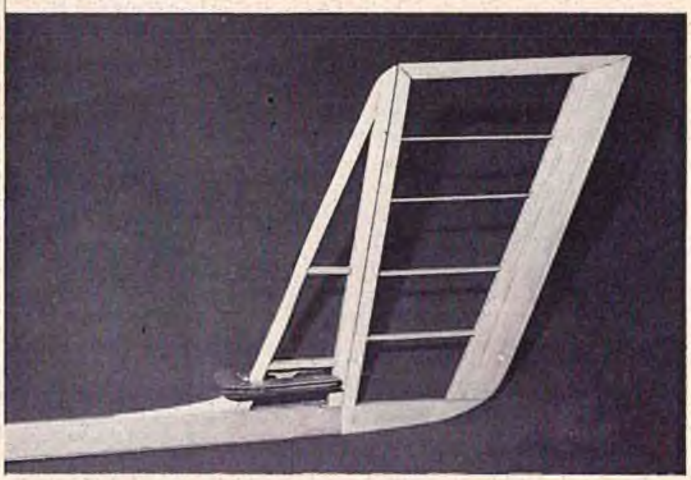
1ST ROW: (L) Boom and fin basic structure. (R) The components that form the fuselage pod. 2ND ROW: (L) Fairing block assembly detail. (R) Control rod relief detail. 3RD ROW: (L) The assembled center section. (R) Bottom view of the pod to the center section assembly. 4TH ROW: (L) A view of the center section carving process. The right side is near completion while the left is still rough.

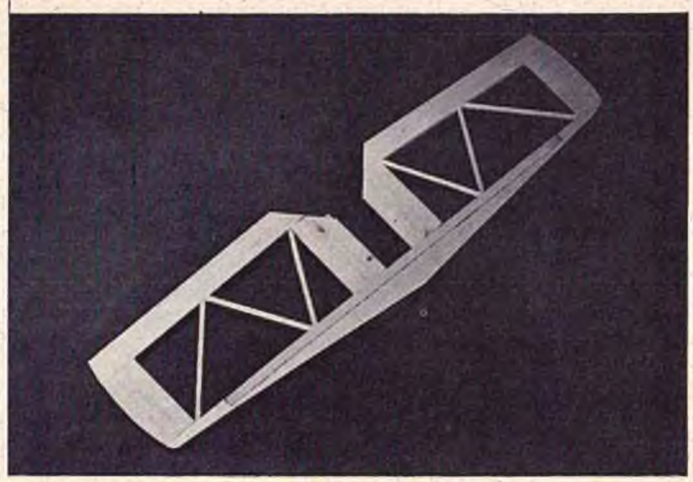


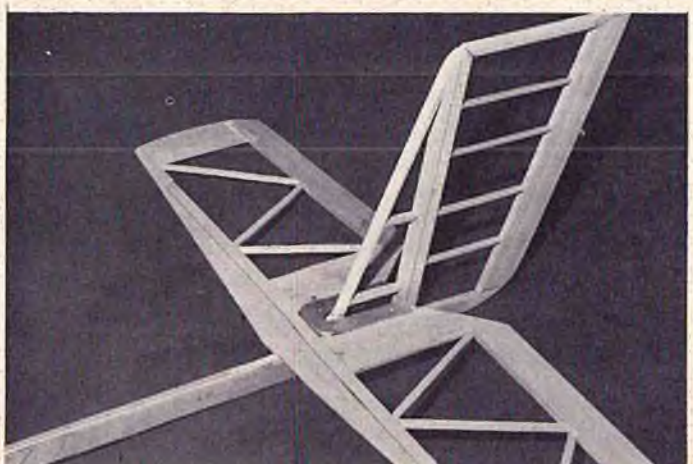


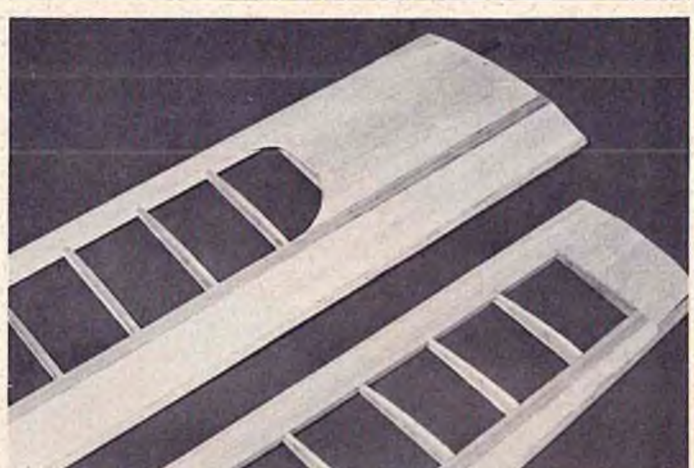
1ST ROW: (L) Incidence detail photo. Use root rib template to outline the airfoil section. (R) View of pod with canopy block removed. Note outer NyRod ends. 2ND ROW: (R) Completed pod with canopy block in place. 3RD ROW: (L) Vertical fin and rudder without horizontal tailplane. (R) Plan view of horizontal stabilizer. 4TH ROW: (L) The completed empennage. (R) Wing tip and root detail.

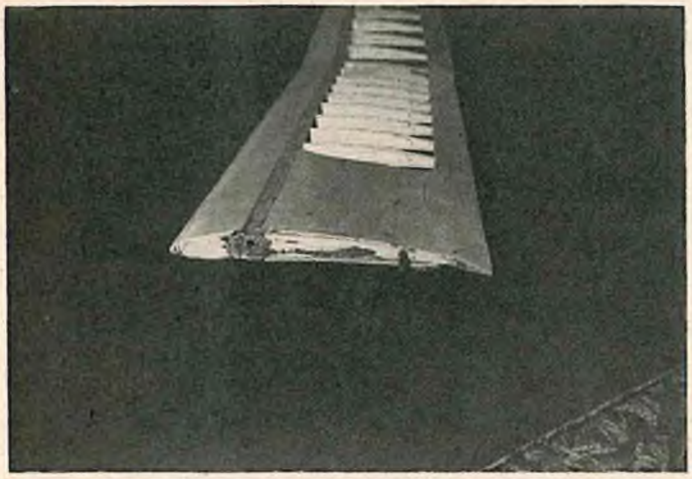


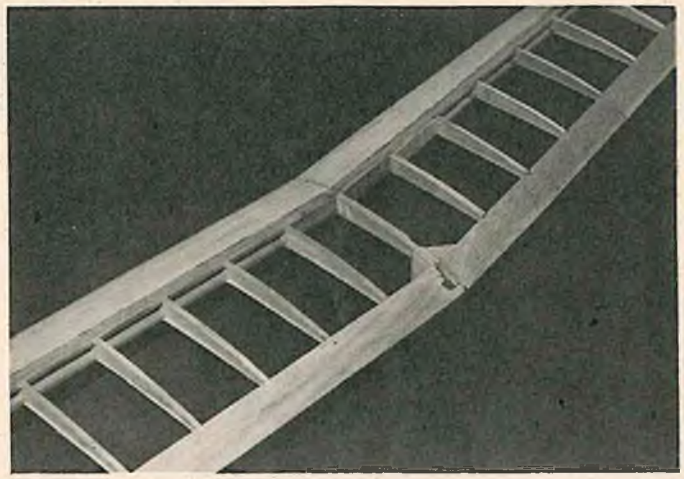


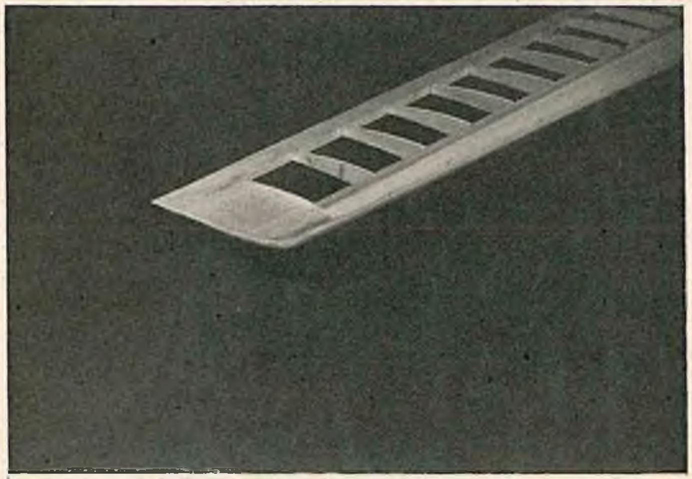


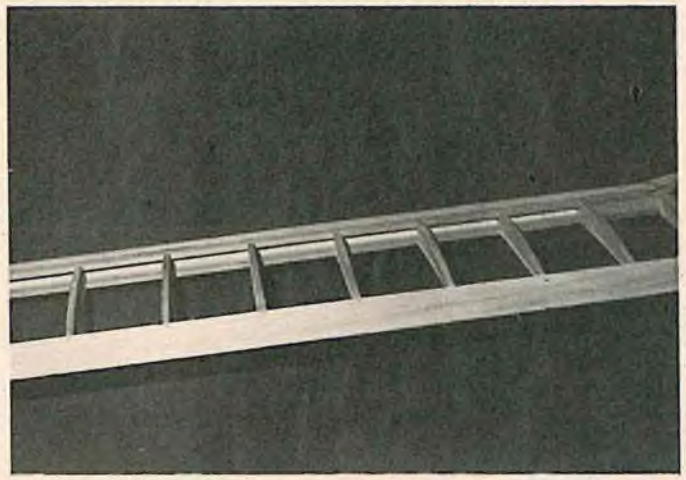


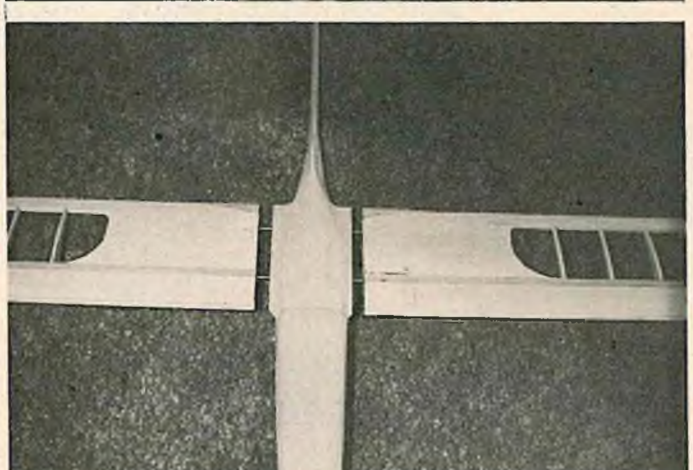


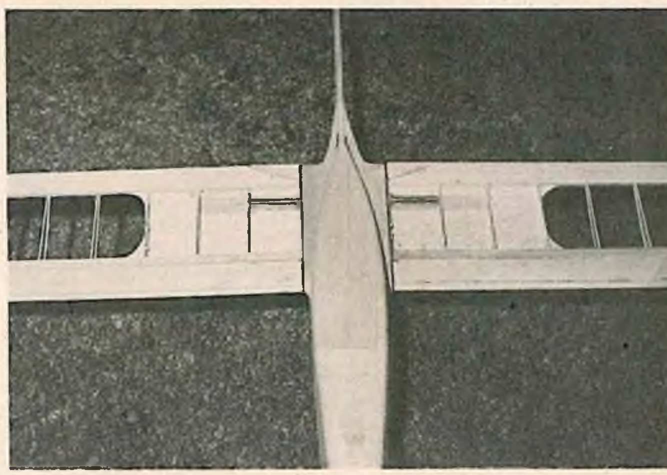




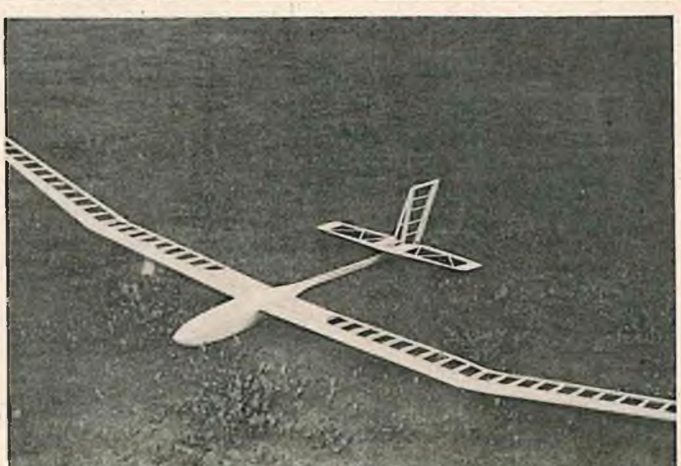








1ST ROW: (L) View of wing root. (R) Detail view of polyhedral joint. 2ND ROW: (L) Wing tip detail. (R) Wing shear web, spar, and rib cap detail. 3RD ROW: (L) Top view of wing joint detail, wing partially inserted. (R) Bottom view of fully inserted wing panels. Bottom sheeting not yet applied. 4TH ROW: (R) The Sundancer, completely built, sanded, and ready for covering.



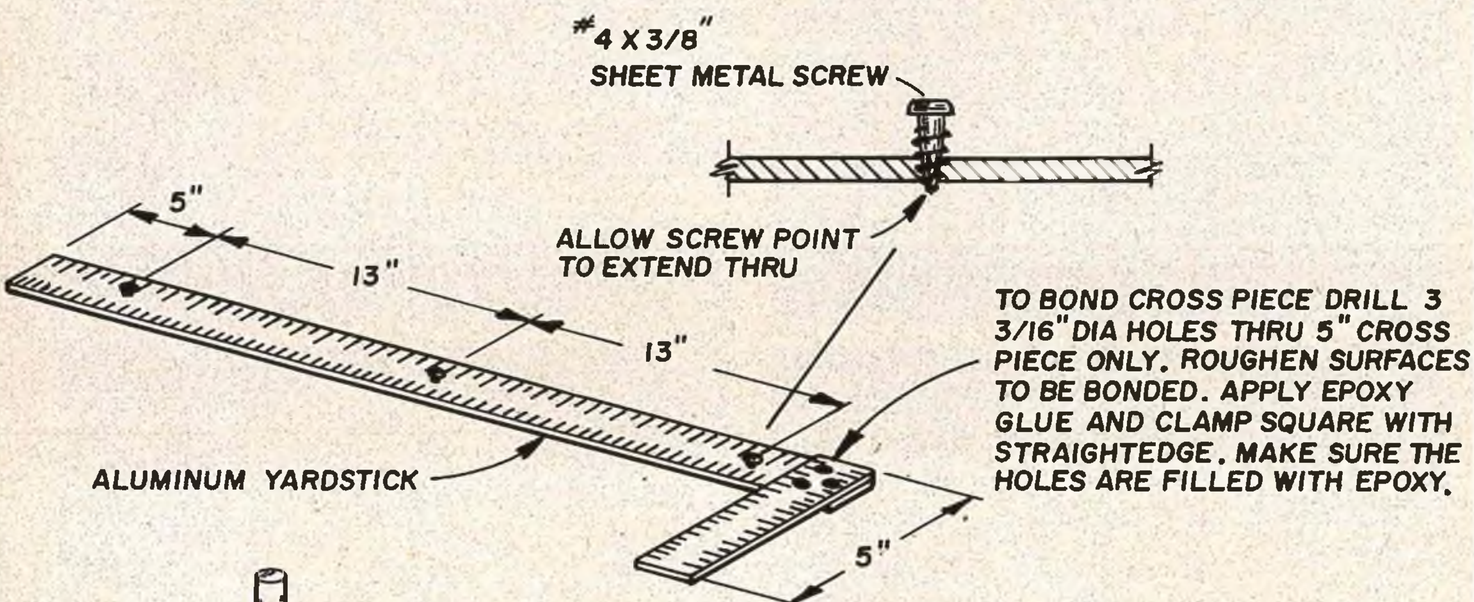
HERE'S HOW

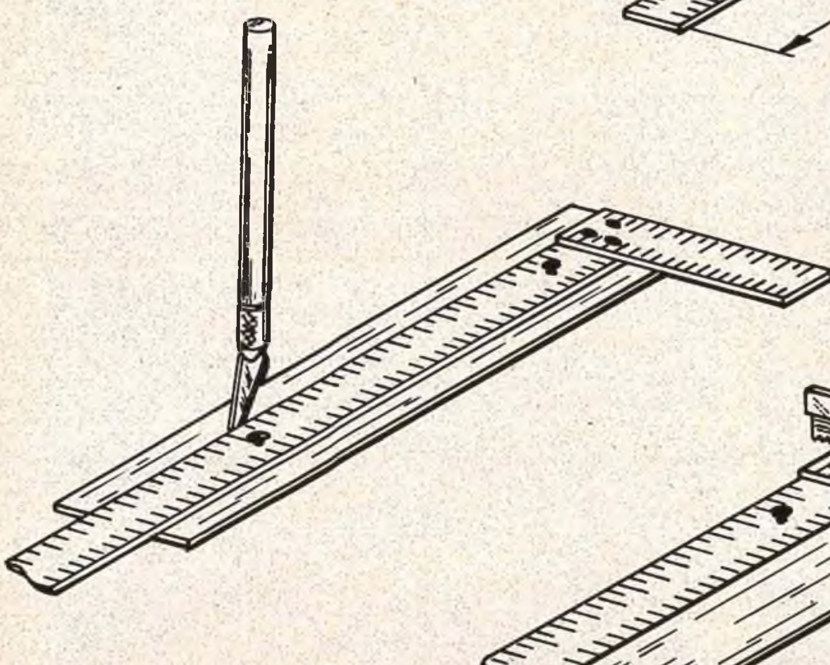
BY JERRY SMITH

HERE'S A HANDY TOOL THAT HAS BEEN AROUND MY WORKSHOP FOR SOME TIME. IT WILL ADD LOADS OF CONVENIENCE AND IS SIMPLE AND CHEAP TO BUILD. IN FACT, AFTER BUILDING YOURS, YOU WILL SOON DISCOVER USES OTHER THAN ITS INTENDED PURPOSE, WHICH IS: (1) TO PROVIDE AN ACCURATE STRAIGHTEDGE, THAT WILL NOT SLIP, FOR STRIPPING AND TRUING UP EDGES OF SHEET BALSA. (2) PROVIDE THE FEATURE OF CUTTING OFF SQUARE.

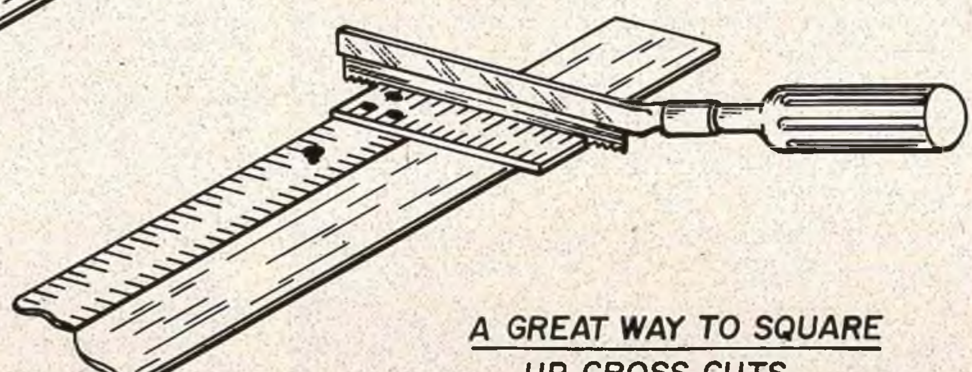
THE STRIPPING AND CUTOFF TOOL, PRESENTED BELOW, IS CONSTRUCTED USING TWO METAL YARDSTICKS, PREFERABLY THOSE MADE OF EXTRUDED ALUMINUM APPROX .075 IN THICKNESS. I FOUND THIS TYPE TO BE EXTRA TRUE. MOST ANY DISCOUNT OR HARDWARE STORE WILL HAVE THEM IN STOCK AND THE PRICE FOR TWO SHOULD BE LESS THAN #3.00.

THE PIECE OF YARDSTICK LEFTOVER CAN BE USED AS AN EXTRA STRAIGHTEDGE OR CUT INTO SHORTER HANDY LENGTHS. THE SHEET METAL SCREWS EXTEND SLIGHTLY THROUGH THE STRAIGHTEDGE PROVIDING THE NONSLIPPING FEATURE MENTIONED.





AN IDEAL STRAIGHTEDGE FOR STRIPPING BALSA



A GREAT WAY TO SQUARE UP CROSS CUTS

THE SOCIETY OF ANTIQUE MODELERS
SAM

BY DON DEWEY

● The Santa Maria Tri-Valley R/C Modelers, the San Diego No-Name Club, SAM 21, and the Southern California Ignition Flyers combined their efforts to stage a "first" on the West Coast on the recent John Pond Commemorative Old Timer R/C Contest. This was a contest for radio controlled old timers held to honor Mr. "Old Timer" himself, John Pond.

John attended the meet and did the things that have endeared him to the Old Timer enthusiasts, freely sharing his vast knowledge of details of models designed in the 1930's and '40's to everyone who had a question. His enthusiastic assistance has been a significant factor in the growth and popularity of the Old Timer movement. This meet had 29 entries and, while the number may not be impressive, the fellowship and pure enjoyment that prevailed in an Old Timer contest made it a great day.

Tom Bristol was the big winner - - - his Class B entry was an Enya .29 glow powered Buzzard Bombshell. His Texaco entry was a Powerhouse with a Merco .61 that had been converted to ignition. The 1½ ounce fuel allotment (white gasoline and oil mixture) provided a 13 minute engine run that resulted in a flight duration of 50 minutes and 20 seconds! To say the least, tremendous mileage and the price is right!

Otto Berhnardt's 96" span Lonzo Record Breaker powered with a K & B .40 glow engine turned in a 35 minute, 56 second flight in the Texaco event.

Bob Sliff's Air Chief with a Taipan .09 diesel had a 18 minute flight in the Texaco Category.

The mortality rate was very low, however, Ross Thomas stayed up all night to get his Johnson 35 powered Playboy Senior ready. The first flight for his machine was a giant arc across the sky with a rather abrupt ending. These things do happen!

In conclusion it was a good contest and a fitting tribute to a fine gentleman, Mr. John Pond. Our thanks to Red Barrows for his report on this event.

●

Joe Beshar submitted a rationale for disallowing down thrust in the Beshar Rules for Old Timers. This reads as follows:

Since the release of the rules of the Free-Flight/RC revolution and the Old Timer Bash of May 16th at Lakehurst, N.J., I have been deluged with interest letters of acceptance offering encouragement. The only concern expressed is that of disallowing down thrust since we used it in some of the original models. Initially, my release could have been clearer in that the no down thrust rule does not apply to ignition engines where the power struggle does not exist. The no down thrust rule only applies to glo engines where the power ratio will be self-monitoring through necessity of old timer model survival, thereby avoiding over powering. On the other hand, however, with "RC" rudder control during engine run another challenge exists in lieu of no down thrust – the model can be controlled to spiral climb which is an interesting challenge.

The rules were designed to survive free-flight with RC assist due to the lack of flying fields and to preserve old timer performance with disallowance of down thrust, but for modern free-flight down thrust would be allowed in conjunction with the other rules.

In summary, I feel that the rules which I have developed is a simple approach to a much needed regulation for the propagation of modern free-flight and the preservation of Old Timer Free-Flight.

This writer will have to take exception to the proposed Beshar Rules with regards to the RC portion of the Old Timer Event. While the Old Timer Event is catching on in interest at a phenomenal rate across the country, we have been deluged with letters completely disagreeing with these type of rules. Most of the contests that have been held by clubs throughout the country are using the radio control system to its prime advantage, rather than simply using it to guide a "free-flight" model. Most of these events are similar to a fun-fly type contest wherein engine and throttle are used to advantage, elevator and rudder are used throughout the flight, and touch-and-goes are included as are spot landings. While this is not meant to detract from free-flighters participating in Old Timer events, when radio control is used in the RC category of this event, then the system should be used to its maximum advantage, as per current day sailplane contests, rather than simply using it as a method to keep the airplane within the confines of the field. This is the opinion stated by the majority of those corresponding with us on this subject, and this column, normally authored by Randy Carman, is open to comments, either pro or con on this subject.

●

The Central Jersey Radio Control Club's Annual S.A.M. Nats Warm-Up AMA sanctioned contest for Old Time free-flight planes assisted by radio control will be held on June 27, 1976. The site is the Middlesex County Model Airport at Piscataway, New Jersey. Events to be held will be Class A, B,

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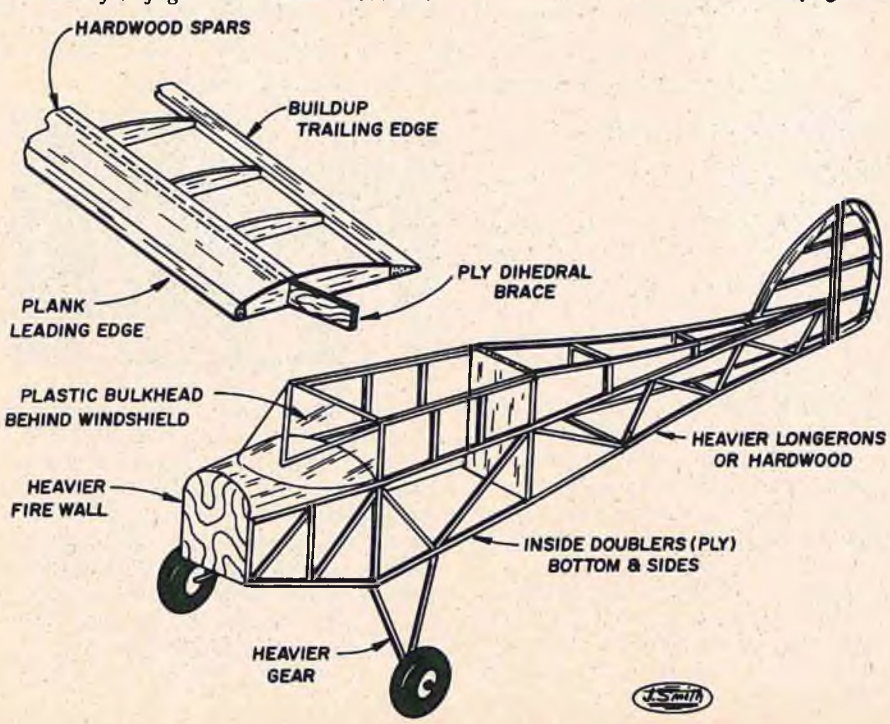
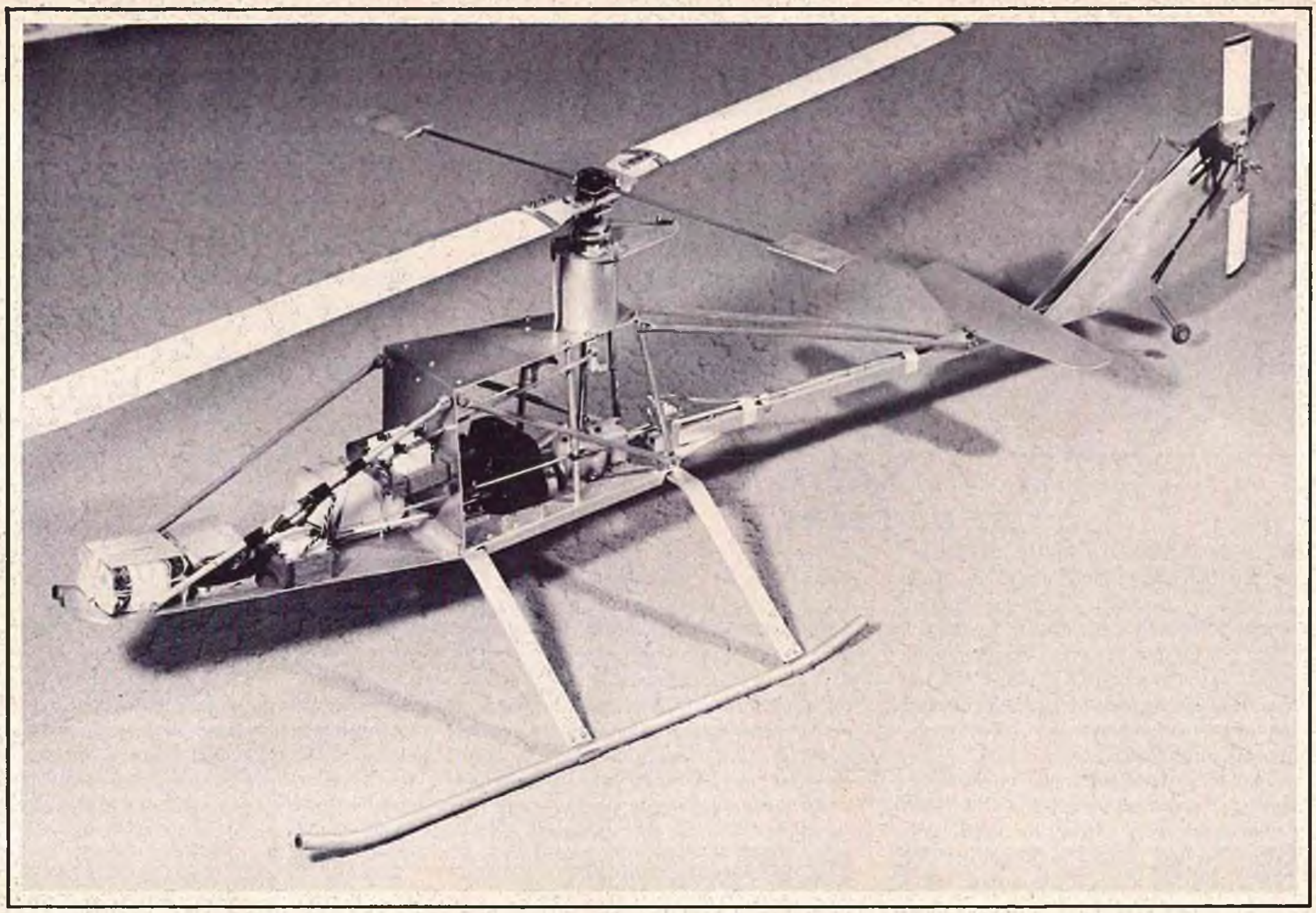




TIN LIZZIE

If you're tired of the hassle of starting, adjusting, repairing, and maintaining the mechanics, radio and controls in that scale chopper, then the Tin Lizzie is for you. Built from aluminum with simple hand tools, it can take abuse that would destroy a scale machine.

BY LOUIS LAVINE

PHOTOS BY MICHAEL MULAREVICH

● The Tin Lizzie, as I have affectionately named the machine, was born out of necessity as you will see as you read on. She was originally a Schluter Bell AH-1G Huey Cobra which was obtained in a swap with a fellow RC flyer. (You will also find that other Schluter mechanics can be adapted for use in this machine.) I gave up trying to operate the rascal in its original configuration after a couple of frustrating months. The hassle of starting, adjusting, repairing, and maintaining the mechanics, radio and controls in the original scale fuselage was just too much for a novice like me. So, out came the drawing board and the birth of "Lizzie" had begun.

After the initial patterns had been transferred to light cardboard, construction started. She took about four 5-hour evenings to build, so you can figure about 20 hours building time plus radio and control installation. She is all aluminum, (mostly 60-61-T6 Type), except for the servo mounts, the tail boom filler block, and, of course, the original main and tail rotor blades.

Simple hand tools are used to build the bird such as an electric drill and bits, a jig saw (sometimes called a Sabre Saw) with a fine tooth metal cutting blade, a couple sizes of hole saws, files, screwdrivers, etc. No machining of parts is necessary.

"Lizzie" was originally powered by a Super Tigre .56 which was later replaced by a Webra Blackhead .61. In any case, at 11½ lbs. flying weight, the model does not require a powerful Schneurle ported engine. Any good .60 size engine will do.

The starting problem was solved in the following manner: Two threaded 1/8" pins were installed 180° apart in the "V" groove of the flywheel. This is done by drilling and tapping the groove to accept the threaded

ABOUT THE AUTHOR

Louis Lavine is a 47 year old Assistant Superintendent of Administrative Services for State Farm Insurance Company, and resides in Tempe, Arizona. He has spent thirty-five years in modeling, the last twenty of them in radio control. Eighteen months ago he began flying R/C helicopters and holds NRCHA membership N171A. Louis is also currently club president of the Miniature Aircraft Pilot's Association (MAPA) of Tempe, Arizona.

pins. Saw a screwdriver slot in the outer end of each pin, then put some epoxy on the threads of the pins before installation. If you ever need to remove the pins, simply heat the flywheel with a torch and they will unscrew with ease. The pins should protrude 1/8" above the flywheel diameter. I then took one of my old leather belts and cut it into 3/8" wide strips, 30" long, and punched 1/8" holes in either end. The engine is started by hooking the belt over one of the flywheel pins, wrapping it around the flywheel four or five times, priming the engine with a squirt of fuel in the intake, hooking up the starting battery and pull! My Webra will usually start on the first try. To keep the belt soft and plyable, soak it for a few minutes in Neetsfoot, castor, or your wife's vegetable base cooking oil.

Some of the advantages of the "Tin Lizzie" are: Easy and fast to build, ease of adjusting and maintaining, (everything is out in the open) she is a good training machine and test bed for your pet ideas, and she is durable and easy to repair. It's a cinch to make new parts, after all **you** built her in the first place!

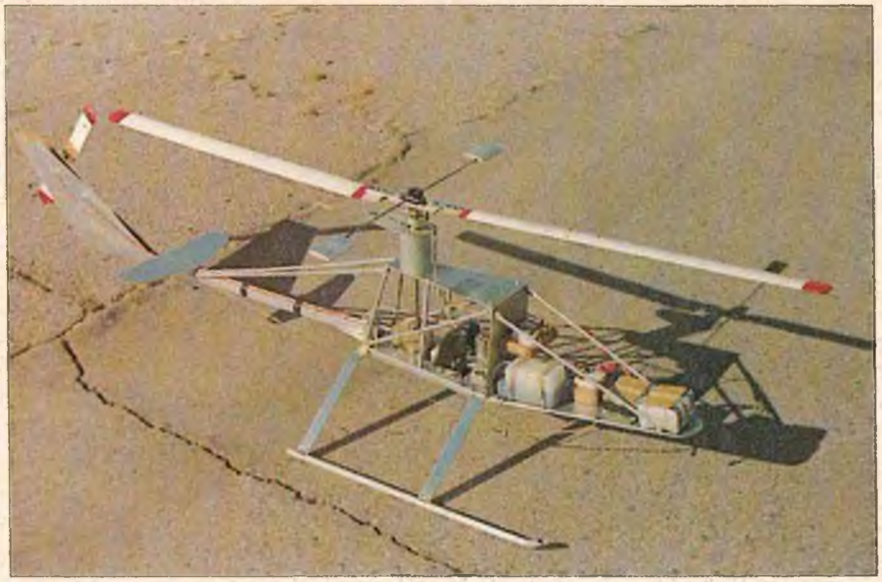
To prove the durability of the machine, "Lizzie" lived through an accident that would have totaled most other choppers, and fixed winged crafts as well. At an altitude of 60 feet, the receiver battery failed and she attempted an outside loop, hitting the asphalt runway inverted at a 45° angle full bore. Needless to say, she sustained damage. The cost to repair, however, not counting a new battery pack, was only $30.00!

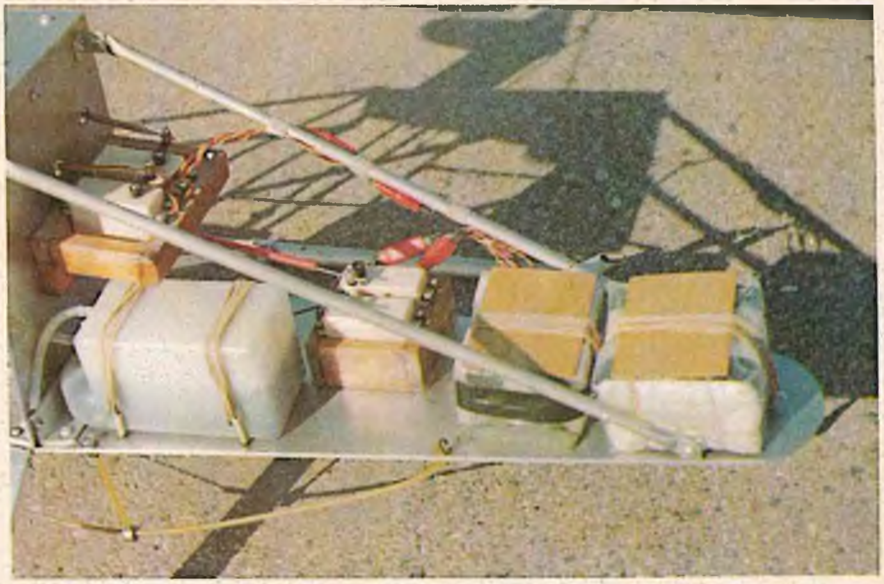
The 60-61-T6 Type aluminum to build the craft can be purchased at any good shop that sells a variety of metal products. Look in the yellow pages under "Aluminum". The soft aluminum stock was purchased at variety stores such as "K-Mart", Handyman, etc. At the time the craft was built six months ago, the total cost of the metal was under $30.00.

It's about time to stop chattering and get to work building the "Tin Lizzie".

(1) The first step in converting your Schluter machine to a "Tin Lizzie' is to remove the components you will be using from the original fuselage. Perform maintenance and repairs on the parts as needed. The only modifications needed are to shorten the main rotor drive shaft to 10½" and to shorten the tail rotor drive cable to approximately 38½". (More on this later.) For the parts needed, refer to the items shown on the left hand side of the line in photo #1.

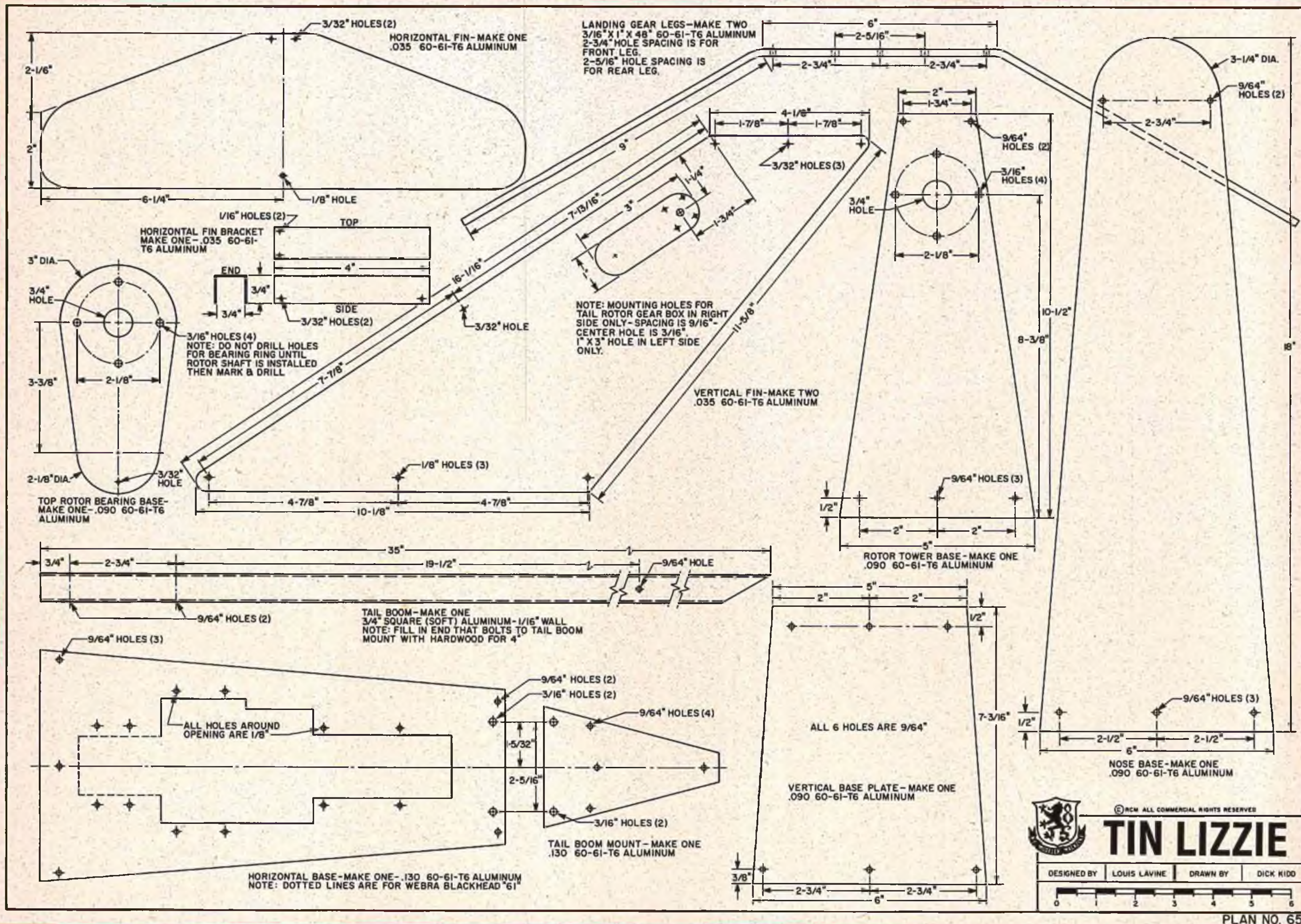
(2) Next, make the sheet aluminum parts shown on the right hand side of photo #1, some parts will be made as we go along. All of the sheet aluminum parts can be cut to shape using your jig (or Sabre) saw. You will probably want to finish the edges with a fine tooth file as this adds to the overall appearance and workmanship with very little effort. Cross file to remove saw marks and draw file to give the edges a polished look. All brace angles are 1/2" soft aluminum angle and are 1/2" wide with a 9/64" hole drilled in the center of each angle

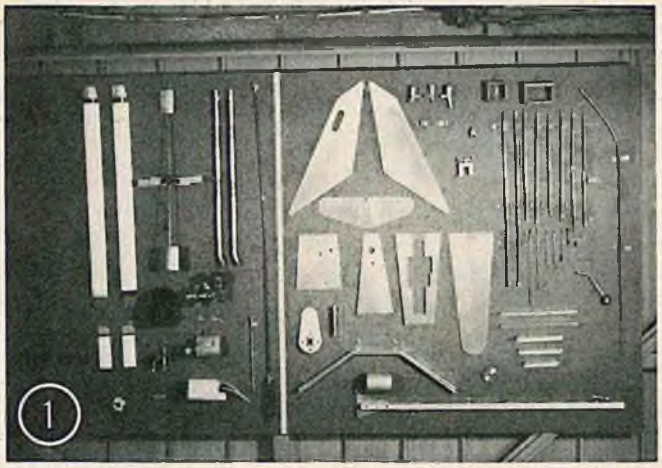




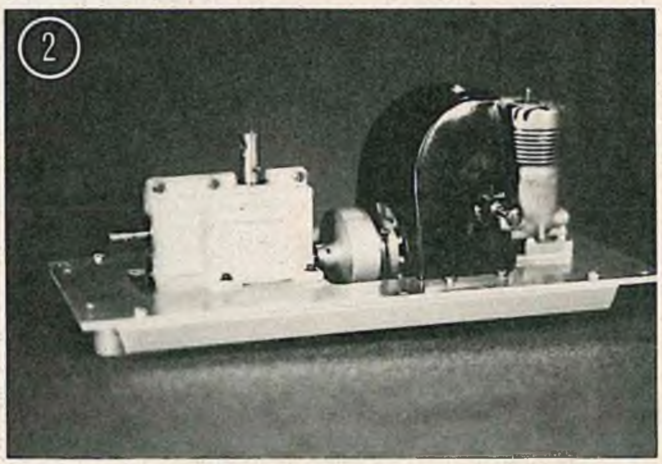
The overall simplicity, ease of construction, ruggedness, and accessibility to all mechanical and radio components can easily be seen in the photographs above. And, using commercially available new or used Schluter mechanics, the Tin Lizzie is an excellent trainer or sport helicopter.

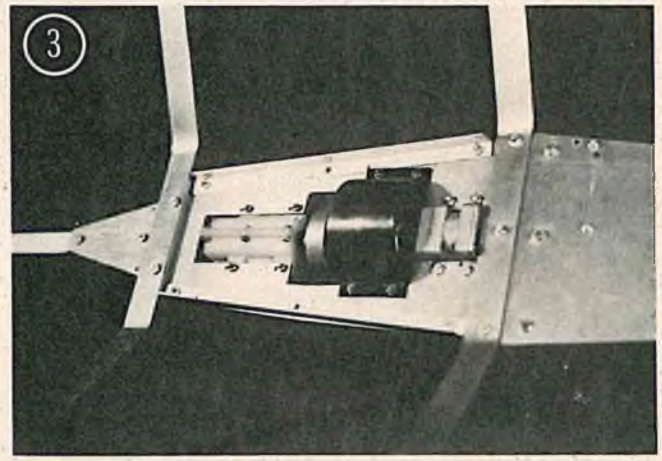
FULL SIZE PLANS AVAILABLE—SEE PAGE 195

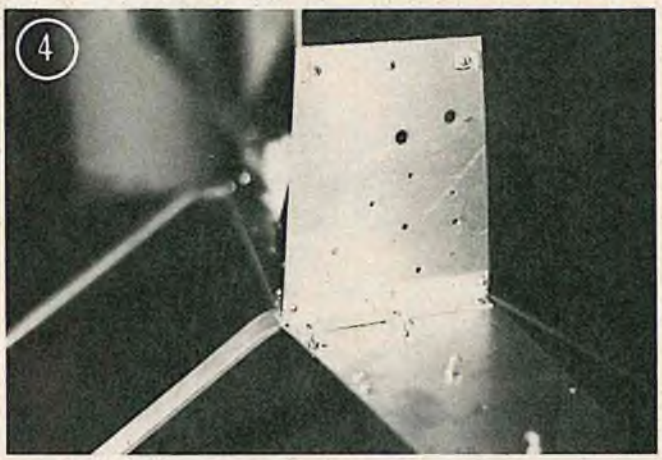


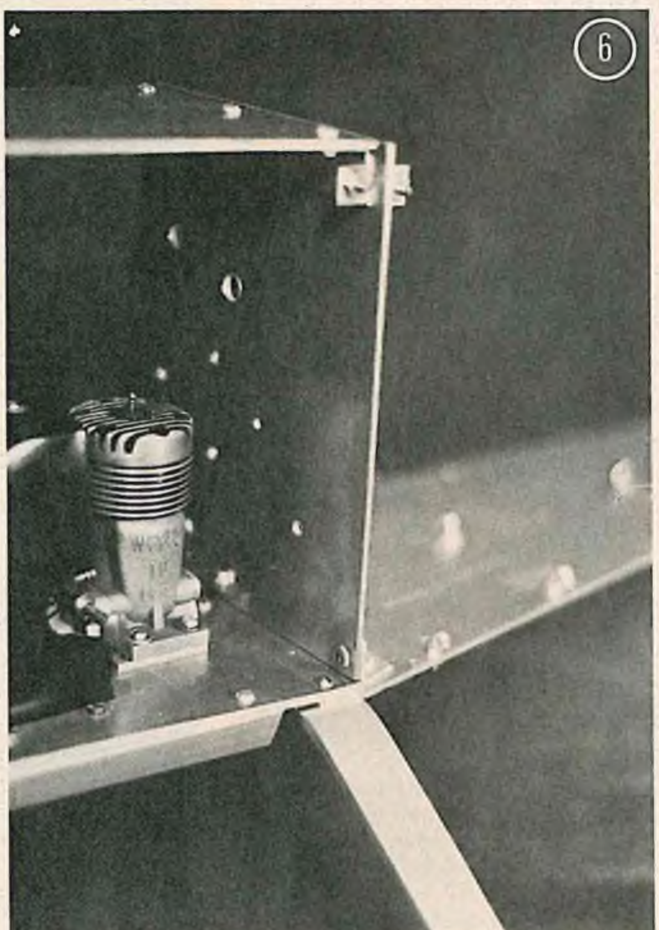


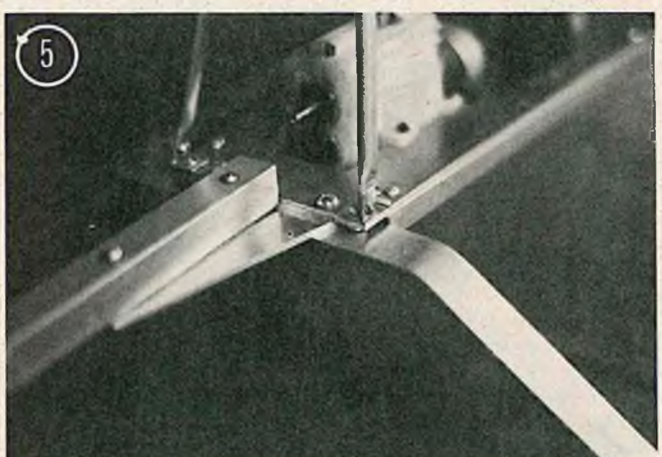
(1) To the left of white line – parts from original helicopter. To the right of the white line – parts to be made. (2) Transmission, clutch, flywheel, fan housing mounted on the horizontal base. (3) Underside of horizontal base. (4) Vertical and nose base. (5) Rear of horizontal base – rear landing gear strut, tail boom and mount. (6) Side view of horizontal base, vertical base, nose base, tower base, 3/4" angles and brace angles.











wing. You will need eight braces.

(3) You are now ready for assembly. Install the 1/2" aluminum angle base stiffeners. These are 10½" long and fit on the underside of the horizontal base between the landing skid struts. Use four 6/32 x 3/8" bolts. Use blue Loctite. (Note: from this point on, use blue Loctite on all bolts and nuts where lock nuts are not used.) See photo #1.

(4) Install the fan housing using the original bolts, and the engine on the horizontal base using four 6/32 x 1" bolts, and the transmission, using the original bolts. See photos #2 and #3.

(5) Install the front landing skid strut and the front angle using three 6/32 x 3/4" bolts. The front angle is 3/4" soft aluminum 6" long. See photo #4 and #6.

(6) Install the tail boom and the rear landing skid strut using two 10/24 x 3/4" bolts. Use epoxy between the tail boom mount and the horizontal base as an added measure. Install the rear base plate brace angles. Use two 6/32 x 3/8" bolts. Install two 6/32 x 3/4" bolts through the two angles. Lock them in place with a nut. They should be pointing outward. See photo #5.

(7) Install the tail boom — use two 6/32 x 1" bolts. You should also use epoxy between the tail boom and tail boom mount. Install the 6/32 x 1½" stud for attaching the rear braces. Lock in place with a 6/32 nut on either side. See photo #5.

(8) Install the right and left halves of the vertical fin using six #4 x 3/8" sheet metal screws.

(9) Install the top angle on the vertical base. The top angle is 3/4" soft aluminum angle 5" long. Install the center bolt first, then the outer bolts which hold the top forward and aft facing brace angles. Use three 6/32 x 3/8" bolts. Install a 6/32 x 1/2" bolt in each brace angle facing outward. Lock in place with a nut. See photo #6.

(10) Install the vertical base plate and the nose plate angle with three 6/32 x 1/2" bolts. The nose plate angle is 3/4" soft aluminum angle 6" long. See photo #6.

(11) Install the receiver, battery and tank, 6/32-"J" bolts and the front nose brace angles using two 6/32 x 3/8" bolts. Install two 6/32 x 1/2" bolts through the angles. Lock in place with a nut. They should face outward. Install the nose base using three 6/32 x 1/2" bolts. See photo #9.

(12) Install the landing skids (you may use the original skids or fabricate a pair using 5/8" O.D. x .032 wall thickness 60-61-T6 aluminum tubing). If you use the original straps to hold the skids in place, you will need to make 1/8" aluminum shims to go between the straps and the skid struts to make up for the difference in the thickness of the original wooden struts and the new struts. See photo #14.

(13) Install the top rotor bearing ring on the top rotor bearing base. Use the original bolts. Assemble the top bearing rotor base and the rotor tower to the rotor tower base. Use four 10/24 x 3⅝" bolts. Install the two 6/32 rear brace spade bolts. Install two

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MATERIAL LIST

Aluminum — 60-61-T6 — Type

Gauge	Size	Parts to be made
1/8" (.125)	7" x 17"	Horizontal base and tail boom mount
3/32" (.090)	7" x 40"	Vertical base, rotor tower base, nose base and top rotor shaft bearing base
1/32" (.032)	13" x 30"	Vertical fins, horizontal fin and horizontal fin mount

1-.065 wall thickness tubing — 2½" diameter x 3¼" high — for main rotor tower.

140"-.035 wall thickness tubing — 5/16" O.D. — for all braces

48"-3/16" x 1" — Strap — Landing skid struts

Soft Aluminum 1/16" Wall Thickness

Description	Part(s) To Be Made
36"-3/4" Square Tubing	Tail boom
18"-3/4" Angle	Base Connecting Angles
36"-1/2" Angle	Horizontal base stiffners, crank mount & brace angle mounts
12"-1/2" Strap	Tail rotor control crank mount, cyclic crank mounts and tail rotor drive cable housing straps.

Sheet Metal Screws

10 #4 x 3/8"
Slot or phillips head
6 #4 x 1/2"
Slot or phillips head
2 #2 x 3/16"
Slot or phillips head

Bolts

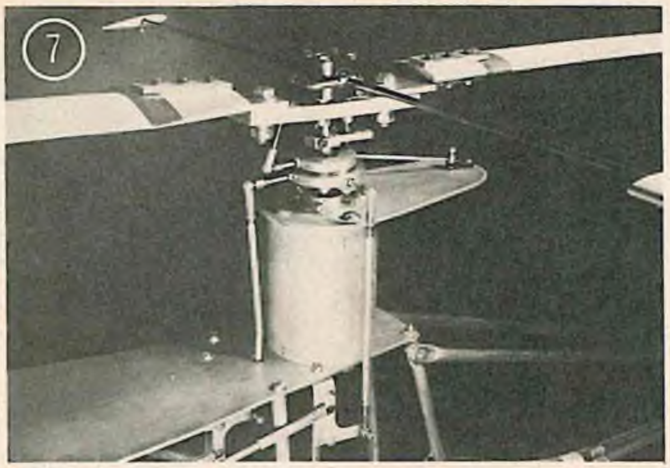
4 10/24 x 3⅝"	Slot or phillips head
2 10/24 x 3/4"	Phillips head
1 6/32 x 1½"	Stud
6 6/32 x 1"	Slot or phillips head
14 6/32 x 3/4"	Slot or phillips head
14 6/32 x 1/2"	Slot or phillips head
14 6/32 x 3/8"	Slot or phillips head
60 6/32	Hex nuts
4 2/56 x 1/4"	Slot or phillips head
7 6/32	"J" bolts
2 6/32	"Spade" bolts

Miscellaneous

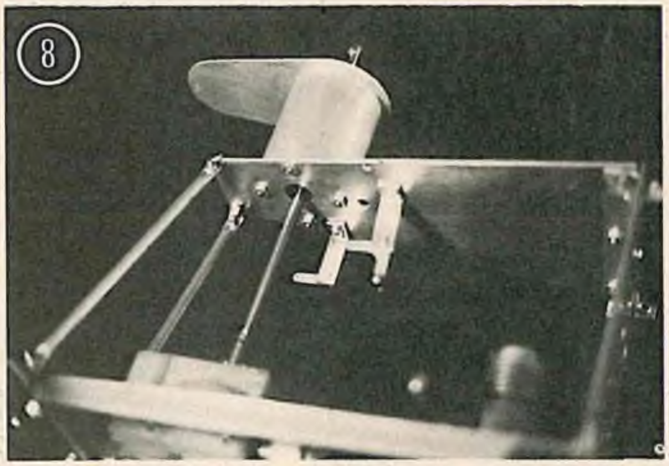
36"-1/4" O.D. brass tubing for tail rotor drive cable housing; 1-4 oz. lead weight (may be needed to add to nose for balance); 1-3" nylon "U" control bell crank for tail rotor control; Tubing, rods, fittings, etc., for control hook-up; 1-1" wheel; 1-12" 3/32 music wire; Tail Wheel (if used); Hardwood for servo mounts and tail boom filler block; 1-tube Locktite (blue).

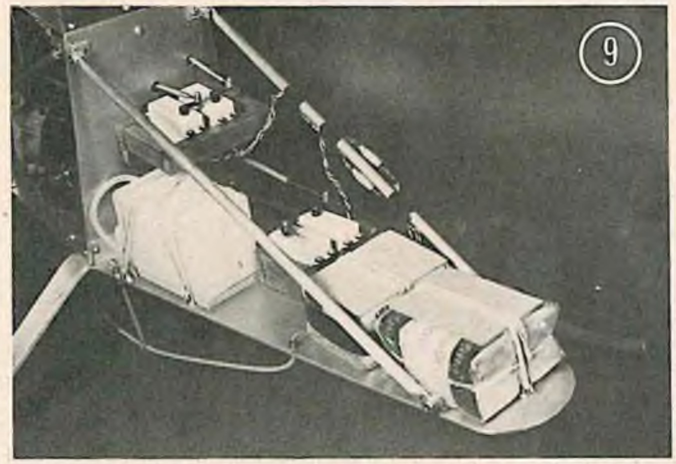
Specifications

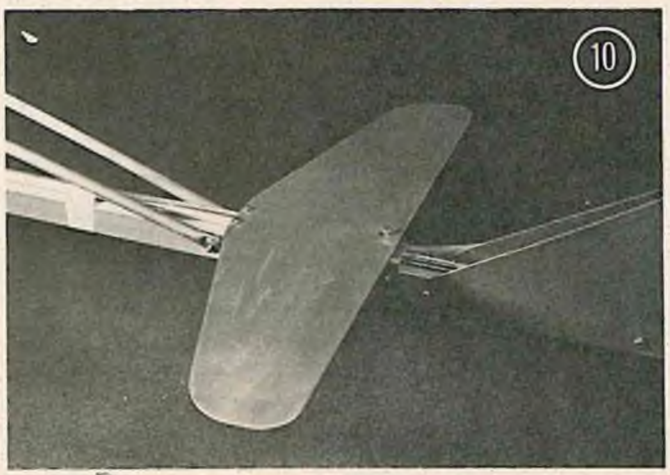
Type	Helicopter
Name	Tin Lizzie
Controls	Engine, Right and Left Tail Rotor, Forward and Reverse Cyclic, Right and Left Cyclic (No Collective Pitch)
Fuselage Length Incl. Vertical Fin	71"
Maximum Fuselage Width	6"
Maximum Height	19¾"
Landing Skid Width	22"
Total Main Rotor Span	64"
Main Rotor Pitch	5°
Total Tail Rotor Span	14"
Total Flying Wt. w/Radio & Fuel	11½ lbs.
Engine Requirement	.56 to .61 C.I.D.
Tank	Kraft 13 oz.
Radio	Four Channels Required

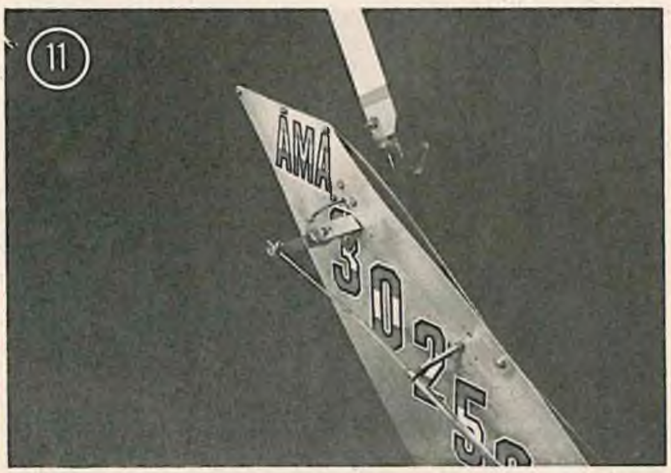


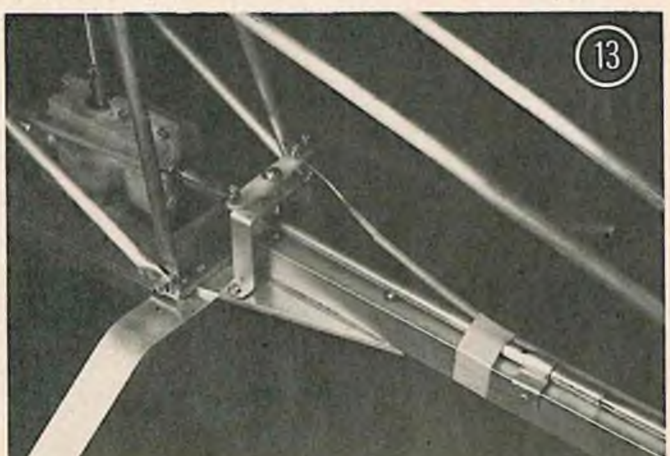
(7) Tower, tower base, swash plate, rotor head and controls. (8) Tower base, tower, control bellcranks. (9) Battery, receiver, servos and tank in place. (10) Tail rotor drive cable housing, horizontal fin. (11) Tail rotor control. (12) Tail rotor assembly. (13) Tail rotor crank and mount.





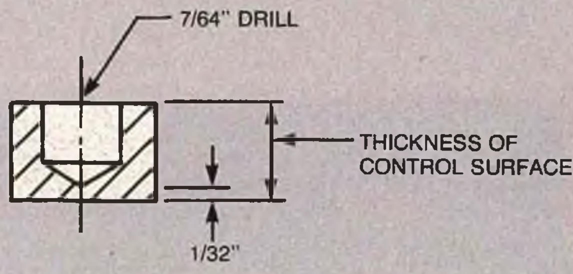




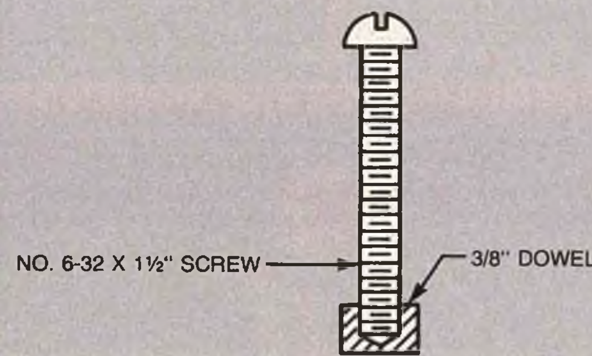


CONTROL HORNS

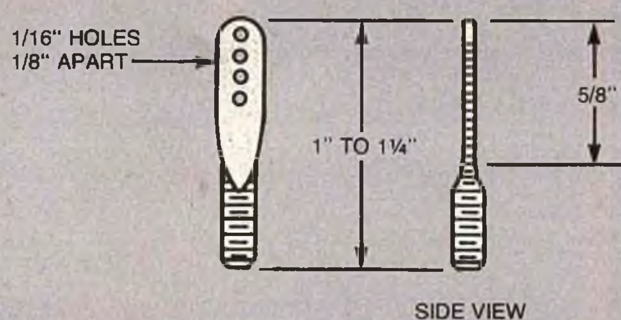
BY NORMAN STIRLING



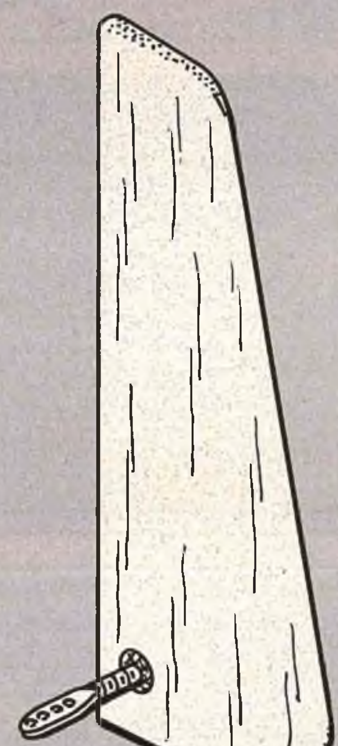
1. CUT A PIECE OF 3/8" DOWEL TO THICKNESS OF CONTROL COMPONENT (RUDDER OR ELEVATOR). DRILL 7/64" HOLE TO DEPTH SHOWN.



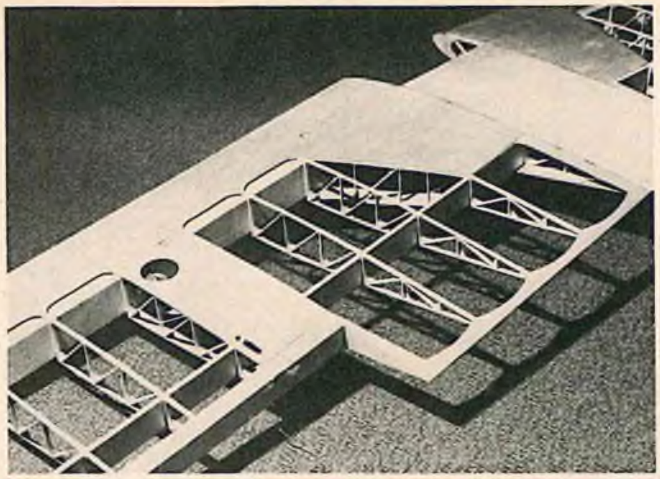
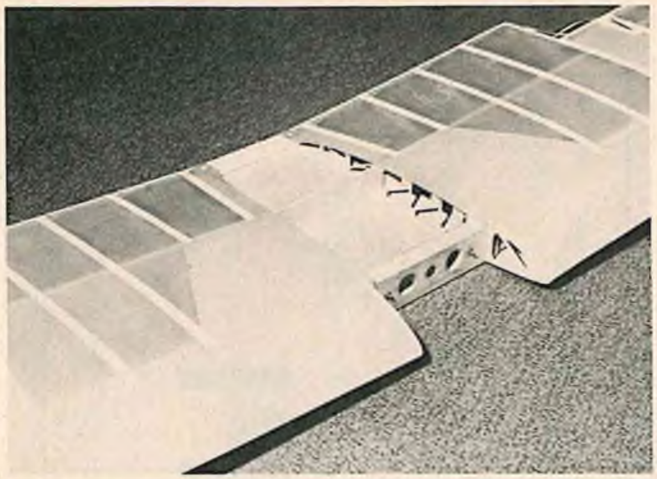
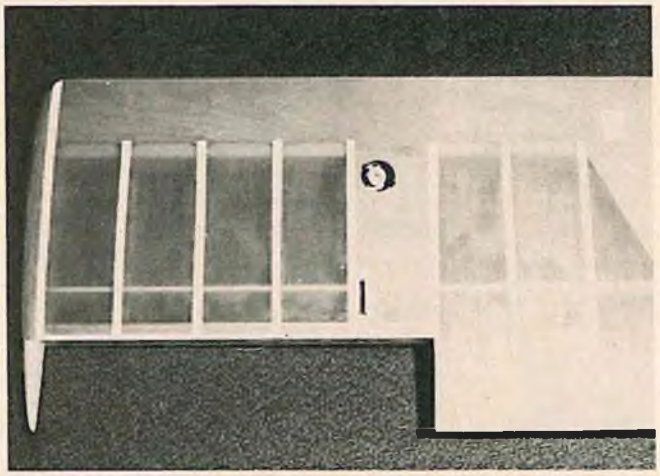
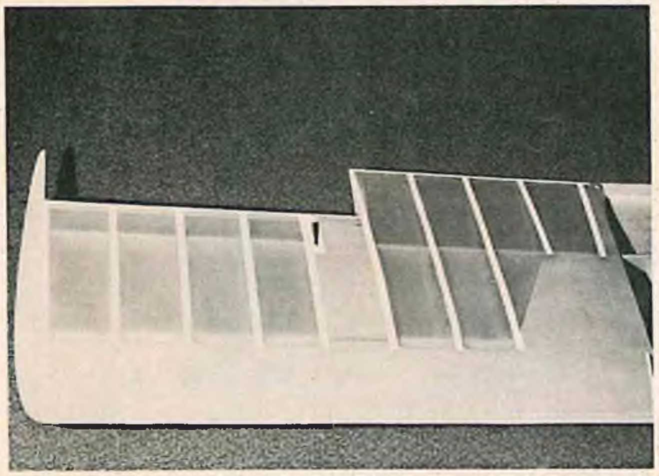
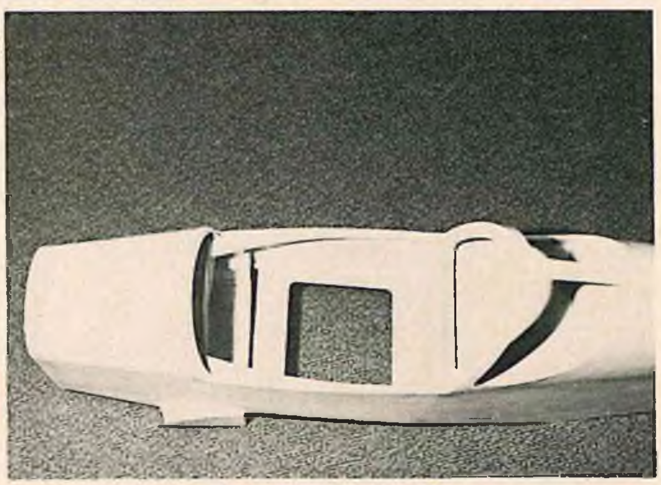
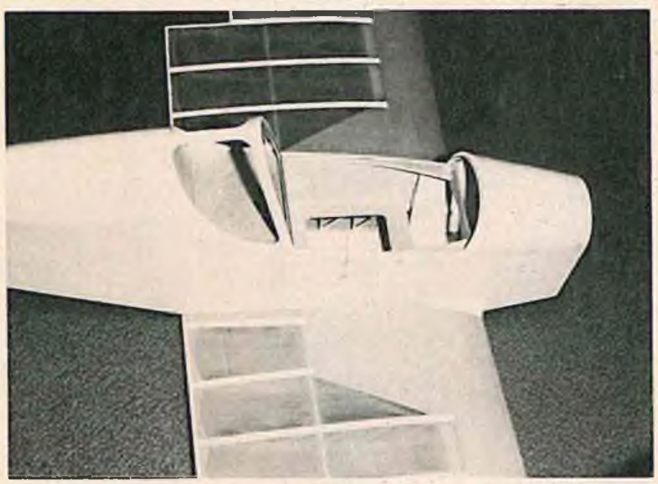
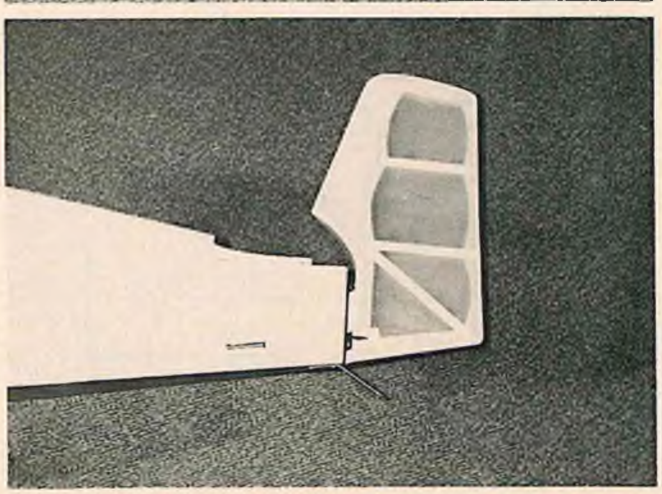
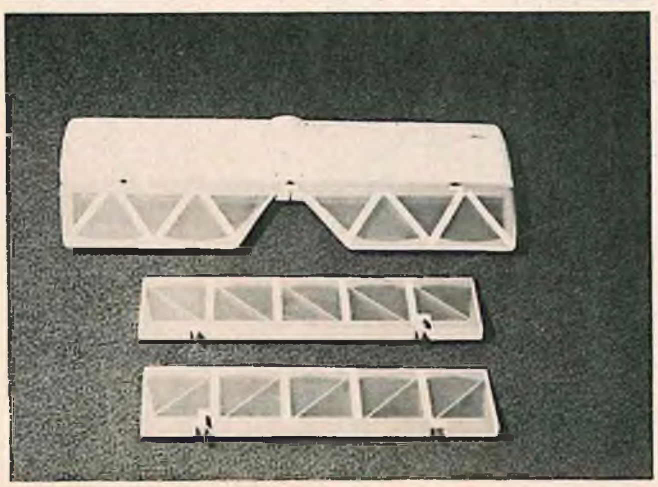
2. THREAD HOLE IN DOWEL WITH A 6-32 X 1½" LONG MACHINE SCREW. FILE OR GRIND END OF SCREW FOR EASY STARTING. HOLD DOWEL LIGHTLY WITH A PAIR OF PLIERS.

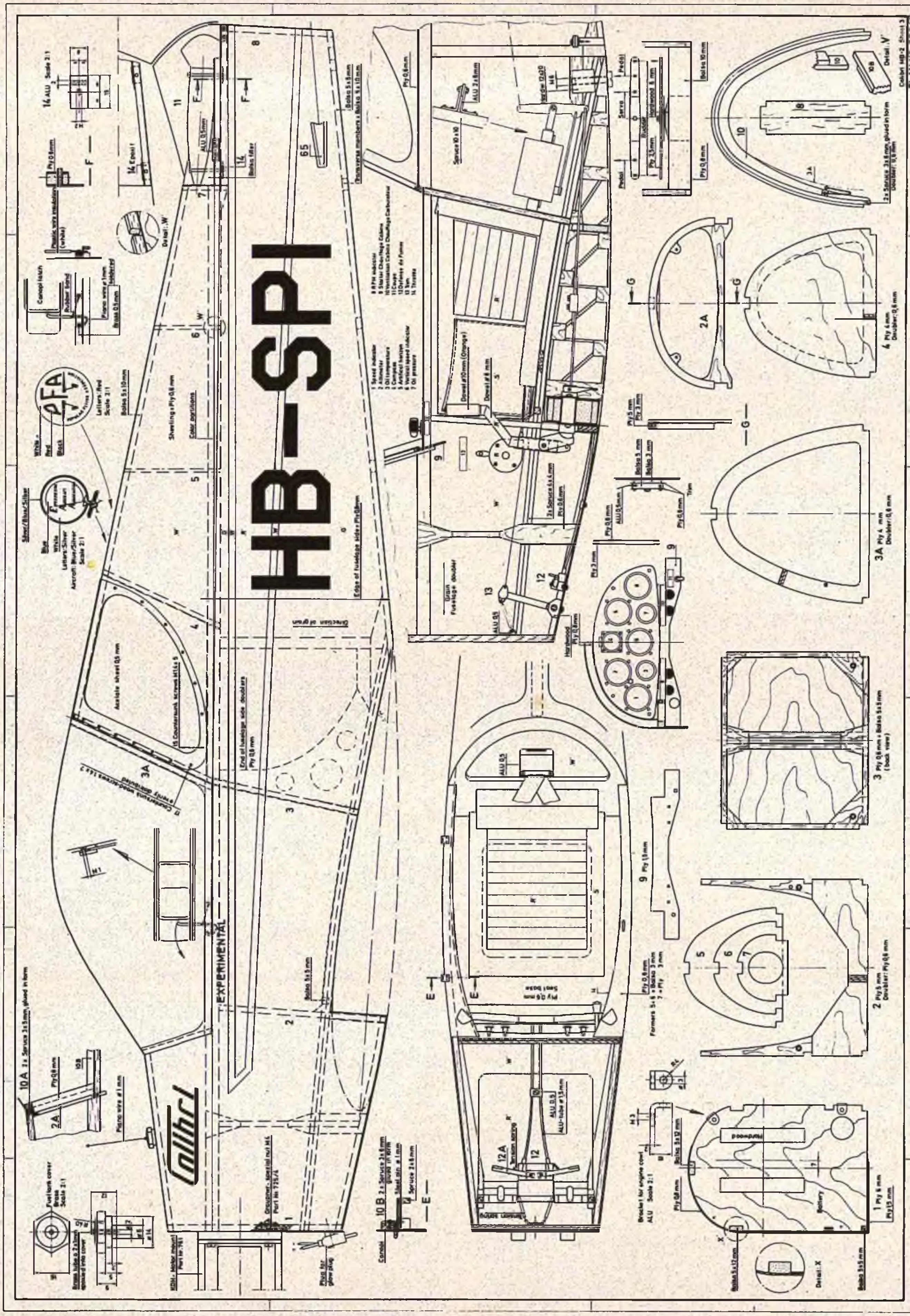


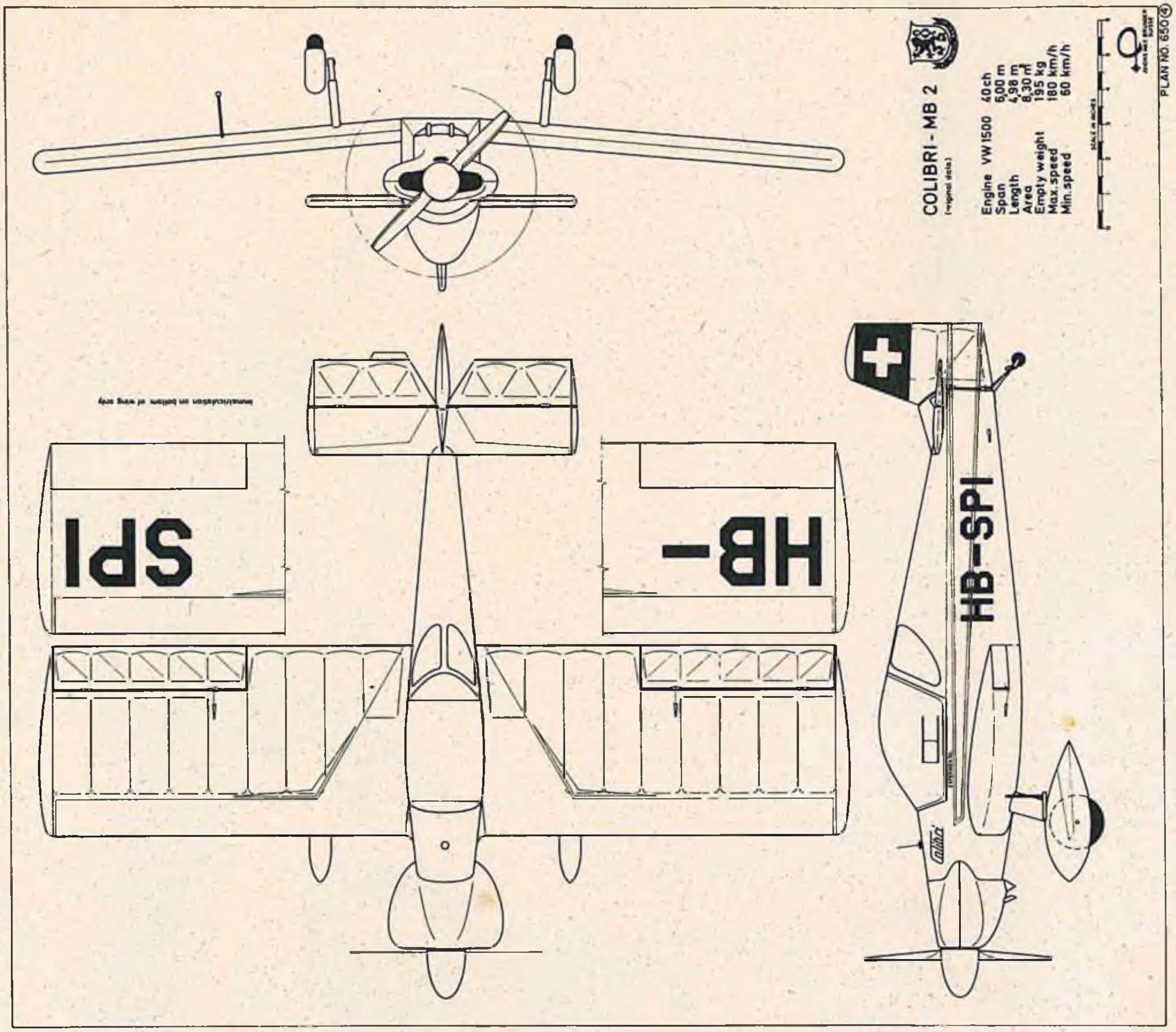
3. REMOVE SCREW FROM DOWEL. CUT HEAD OFF. FLATTEN HEADLESS END TO ABOUT 5/8" LONG. USE VISE ANVIL AND HAMMER. DRILL 3 OR 4 1/16" HOLES AT 1/8" APART. CUT SCREW TO LENGTH REQUIRED. REMOVE ANY BURRS.



4. DRILL A 23/64" HOLE IN CONTROL COMPONENT (RUDDER OR ELEVATOR) AT DESIRED POSITION. COAT CIRCUMFERENCE OF DOWEL WITH 5 MINUTE EPOXY. PRESS DOWEL INTO 23/64" HOLE SO BOTH ENDS ARE FLUSH WITH CONTROL SURFACE. SMOOTH OUT EXCESS EPOXY. WHEN DRY, SAND LIGHTLY. COAT THREADS OF SCREW WITH 5 MINUTE EPOXY. TURN SCREW INTO 3/8" DOWEL CAREFULLY, FULL DEPTH. ALIGN SCREW AS REQUIRED. MASK SCREW FOR PAINTING. RESULT: THE CLEANEST CONTROL HORN INSTALLATION YOU CAN GET, AND STRONG.


HB-SPI
EXPERIMENTAL
PLAN NO. 650(4)



first. The detachment of the landing gear is performed by unbolting the M3 bolts, which improves the maintenance of the wing and landing gear. The design of the landing gear is very similar to that of the original. Instead of rectangular steel tube, I used an equivalent aluminum extrusion (weight reduction approximately 70 grams [2.5 ounces]). The brakes are dummies only, while the wheel cowls are designed dimensionally and materially correct.

The fuselage is designed to be simple and built mainly from ply - - - only some non-visible formers and spars are made from balsa. I used a Graupner HB .61 engine with a 400 ccm (24.5 cubic inches) tank. The muffler is absolutely true-to-scale. The exhaust is lead through two exhaust tubes below the fuselage. Mr. Fung, the manufacturer of the "Minivox" mufflers, changed a "Sport-Q-Muffler" to a scale version of the Colibri muffler. This version is not only optically perfect, but it also reduces spoiling the model with exhaust residue very effectively. This muffler can be purchased directly from the manufacturer, the part designation is Muffler "Sport-Q-MB 2.

The dummy of the 1500 ccm VW engine is built similar to that on the "Turbulent D-31", but is, as well as the HB .61, completely covered by the engine cowl. There should not be any cooling air problems, however for increased safety, I cut a 30 x 10mm cooling slot into the cowl on the engine side. More problems were found with the current supply of the glow plug. A direct access was not available due to the engine cowl. Therefore, I had to attach a plug to former No. 1, which is connected to the plug and the engine housing with a cable.

On this model I also paid utmost attention to the interior of the cockpit. The instruments and inscriptions were drawn full size and photographically reduced to the models scale. The panel, itself, gave me some problems. The surface of the shrink-enamel should be three times finer than on the original. Since I could not produce it with paint, I used black wet-or-dry sanding paper (180 grit), which produced the correct appearance. A coat of clear lacquer was sprayed over it. The instrument housings are produced on a lathe from aluminum. The side linings, as well as the seat cushions, are made from black and red self adhesive plastic. Of course, not even the map is missing in the cockpit. All important controls are fully operational, such as the control stick, foot pedals and throttle, which are linked to the servos. The R/C equipment could be ideally placed and is not visible on the fully assembled model. The receiver, as well as aileron and throttle servos, are mounted under the seat in the wing. The servos for elevator and rudder are mounted in the fuselage. The R/C equipment is easily accessible through the seat by lifting the cushion.

The canopy is mounted as a subassembly, and is lifted sidewards. A lot of patience is required to make the canopy fit. Due to the size of the parts and the reliability, I could not produce this item true-to-scale. The lock is made in such a way that the difference in appearance between the original and the model is minimal. As on the original, the unlocking is performed through the ventilation opening.

The fuselage is covered with a thin nylon fabric, while the artificial silk, manufac-

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AMA
1
U.S. AIR FORCE
2
3
AMA

AMA FIELD CART

Used by the AMA Show Team, this Field Cart would be an excellent club project.

BY BILL RISKO, JR.

● No doubt about it, R/C flying is fun, educational, frustrating and time-consuming. Most flyers aren't happy unless they have balsa dust in their eyes, ears and throat, the smell of model fuel on their clothes, and a dirty rag in their back pocket. Flying comes before all else, and provides a thrill and sense of achievement that is unsurpassed.

In addition to this, the R/C pilot is a showman at heart and enjoys performing for spectators — sharing his hobby with anyone who appears the least bit interested. And in case you haven't noticed, the general public is very much interested in this fast growing hobby-sport of R/C flying and desires to participate in it, if only mentally.

With these thoughts in mind, the AMA Show Team was created. Through the efforts of Bob Lopshire and all of the team members, the Show Team has developed a degree of professionalism second to none and has been privileged to perform in many air shows as well as being the star attraction at many civic organization functions.

But how professional can you look with a plane stuffed in your armpit, a gallon of fuel in your teeth, a starting motor between your legs, a battery hanging from your neck and dragging a transmitter behind by its extended antenna? It was the consensus of the team to do away with this one-man-band appearance and to build an all-purpose cart that would carry everything but the plane. I was "volunteered" to build this device because, being the announcer, I didn't have to contend with equipment maintenance and dirty rags — just chapped lips and a sore throat.

The following features and items were deemed necessary for proper team support and will prove adequate for any club desiring to undertake construction of this cart:

(1) two starting motors.
(2) two glow plug leads.
(3) two fuel pumps.
(4) storage space for small parts and props.
(5) two gallons of fuel.
(6) storage for six transmitters.
(7) electrical overload protection.
(8) built-in battery charger.
(9) total mobility.

In addition to the above, the cart can be transported to the flying site either horizontally or vertically.

I suggest you read this article through and study the photographs and diagrams before starting construction. Some of the minute details have been left out, assuming the builder is aware of basic building techniques.

The framework and shelving are cut from a 4' x 8' x 3/8" piece of exterior grade plywood. Shelf and corner supports are 3/4" strips cut from 1" x 8" x 8' white pine (1" lumber, dressed, is approximately 3/4", therefore the supports are 3/4" square). Bottom reinforcing is also white pine. Start by laying out sides, back, top, bottom, front panel and shelves on the plywood sheet. Cutting can be accomplished in several ways (sabre saw, hand saw, etc.), but the truest cuts will be accomplished using a bench or table saw. The next step is to rip the white pine into 3/4" x 3/4" strips, approximately 18' required.

Now look at Figure 1. It should be noted that the top and bottom fit inside of the side panels and the back fits outside of the side panels. All corners are reinforced with the pine strips which are glued with Titebond and fastened with three #6 x 3/4" FHB wood screws per side. Pre-drill all screw holes in the 3/4" plywood and countersink using a rosebud countersink. Screw heads should be sunk approximately 1/16" below surface so that all screws can be hidden by Plastic Wood. Lead holes in the pine strips are required to prevent splitting. The location of the screws is not critical, but they should be evenly spaced, being careful not to put one in from the side and another directly above or below it. They must be staggered.

The bottom of the cart is reinforced using lengths of pine as doublers, cut to the proper length of 12⅛". The length of the doubler runs the width of the cart butting against the left 3/4" reinforcing strip (as viewed from the front of the cart). The width of the doublers should extend from the front edge of the cart to approximately 5" from the rear. If more than one piece of pine is used, the width of each should be at least 3". Glue to the base of the cart using liberal quantities of Titebond, clamp securely, and allow to dry thoroughly. This added support is necessary because most of the weight will be placed on the front edge of the base. This is where the stand is mounted.

Running true to form, the kids now come in and want to know when the wheels and engine will be installed in their new go-cart. But being full of tact, as all modelers are, you hasten to explain that this is "daddy's new toy" and that it will be used by the members of his R/C club. And hastily that "you kids had better keep your grubby hands off." Thus ends the first family crisis.

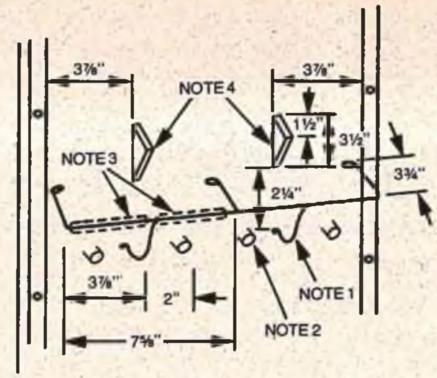
Refer again to Figure 1 and note the location of the shelf. (The shelf is 17¼" x 13⅞".) First, fasten the shelf ends to white pine strips — use Titebond and wood screws. (The shelf rests on top of the strips.) Before installing the shelf, the left edge must be notched to allow installation of the battery cables and the rear corners cut out so that the shelf will fit around the white pine corner supports and flush with the rear of the cart (see photo). Place the cables in grooves and secure the shelf to the sides of the cart, using screws and Titebond. (Please, don't put the screws into the cables!) Make sure the cables aren't pinched, but can be moved up and down. No strip is required on the back of the shelf — just the ends. Now cut another shelf (17¼" x 13⅞") and notch the rear corners the same as above. This is the support for the bottom drawer and also serves to keep material from falling out when the cart is laid down. (The top drawer runners are screwed directly to the underside of the cart top.) Fasten the bottom shelf support to the sides of the cart using two #6 x 3/4" FHB screws per end and glue. No pine strip supports are required here. Be careful when drilling the lead holes in the ends of the 3/8" plywood shelf. If they aren't centered, the plywood will split. As before, countersink all holes.

Now let's put this plywood coffin aside and take a look at the fun part of this project. All electrical power is supplied by a 12V car battery which will give many hours of use before recharging is required.

"So what's fun about that?" I hear you say. Well, one of the features of this thing is that it can be laid on its back for transportation to and from the flying site. (The same goes for a few modelers I know following a party!) Therefore, the battery must be free to swing (now that sounds obscene) otherwise the battery acid will spill out causing all sorts of damage to the cart's "innards." After many hours of trial and effort, eleven gin and tonics, and a pack of cigarettes, I feel I have come up with the easiest way of accomplishing this feat of black magic.

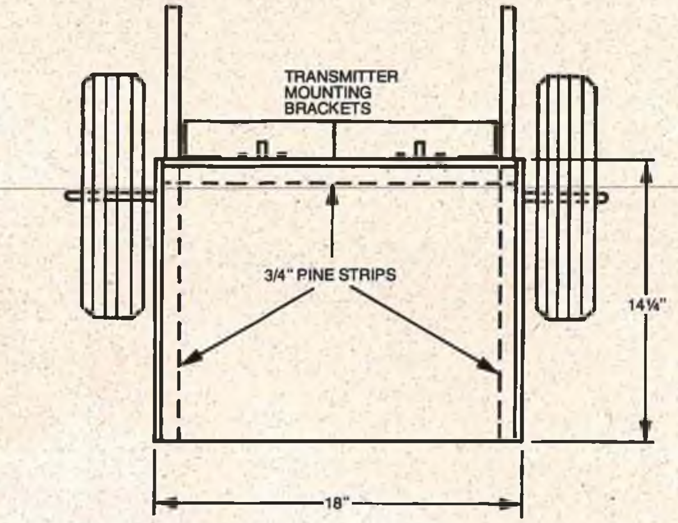
The battery must be 10" x 8" x 6¾" or it won't fit in the cart. The bottom support is a piece of aluminum 11¾" x 3½" x 1/8" (see photo). Center the battery on the aluminum base and draw a line at each end. Cut two 6½" pieces of 3/4" x 3/4" angle iron and center on the base with the inside edge of the vertical section of angle along the pencil line on the aluminum. Clamp the iron to the base with C-clamps and drill two 1/16" holes through the iron and the aluminum base. The holes should be 1¼" in from the edge of the aluminum and centered on the base section of the iron. Drill and tap the angle iron using anything available (1/8" to 3/16"). Drill the holes in the aluminum base to suit the size of bolt selected. Fasten the angle iron to the aluminum base and cut the bolts off flush with the iron. Trial fit the battery; if it doesn't fit, ream holes in the aluminum so that the angle iron can be adjusted to fit.

To fasten the battery to the base, use the following procedure: (**Caution:** Handle battery only when sober and when in full control of all your emotions. This thing is full of acid which can put funny little holes in your clothes and your hands. Also, don't smoke or you may put a large funny hole in you workshop — it **can** explode!) Center the battery on your recently completed base. Place the battery hold-down frame over the top of the battery and install the hold-down brackets on the holder. The brackets come



NOTE #1 1/8" MUSIC WIRE, 90° BEND 2½" PER SIDE. BOTTOM END FITS INTO HOLE DRILLED IN REAR PANEL.
NOTE #2 #6 x 3/4" PH SCREW COVERED WITH FUEL TUBING. USED TO KEEP TRANSMITTER LEVEL IN HOLDER.
NOTE #3 ALL SECTIONS COVERED WITH FUEL TUBING TO PROTECT TRANSMITTER CASES FROM SCRATCHES. TUBING SPLIT LENGTHWISE & PLACED ON BRACKET AFTER SOLDERING.
NOTE #4 3/8" PLYWOOD WEDGES TO PROVIDE OVERLAPPING ANGLE OF TRANSMITTERS.

FIGURE 2A



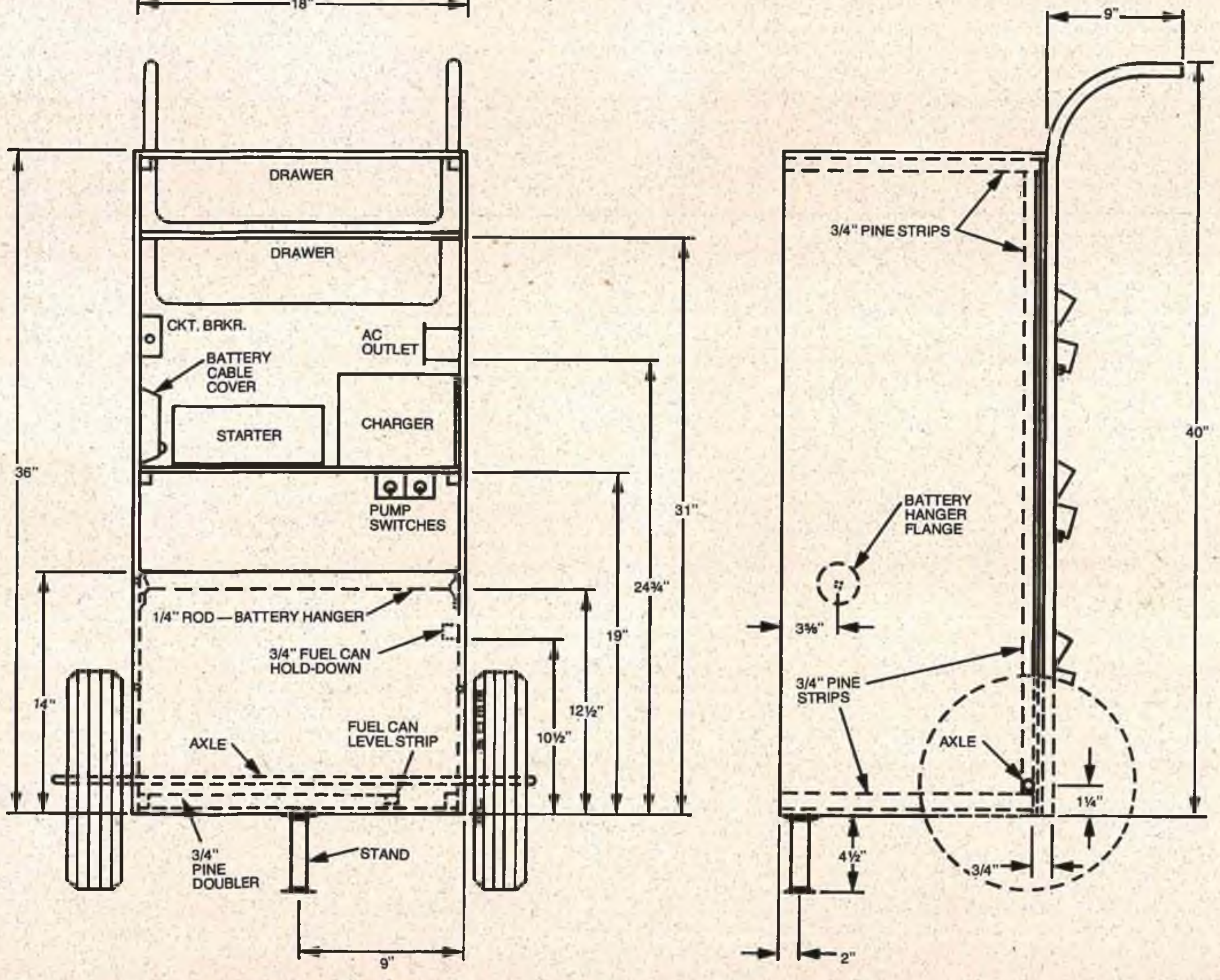


FIGURE 1

with a hold-down frame. Mark the aluminum base directly below the hole in the brackets. Remove the battery. Drill a 3/16" hole in the base at the previously marked location. Turn the aluminum base over and, with the hole extending out over the edge of your workbench, install a 10" hold-down bolt through the 3/16" hole in the base and top the bolt head with a hammer so that the inside square edges of the bolt cut into the aluminum. Now use a small file to square off the hole. This will seat the bolt so that it won't turn. Repeat this procedure for the other bolt. Now, with the bolts through the aluminum base, place a hold-down bracket, a washer, and a nut on each bolt. Heat the threaded end of the bolt with a torch and, using a 1/4" steel rod as a gauge, bend the bolt around the rod so that a hook is formed. The bend should be 1¼" from the end. If all of these parts aren't on the bolt prior to bending, you can't get them on **after** bending. Follow the above procedure for the second hold-down bolt. Next, place the battery on the base and put the hold-down assembly in place. Tighten the nuts until the hold-down bracket snugs up against the battery case. This assembly is now complete. (See photo for complete assembly.)

About this time Mrs. Wife will be in the work room wondering how much longer you are going to play with that silly stuff. Knowing full well that she could never comprehend the complexity of such a worthwhile project, you try to take her mind off of it with some interesting comment like, "Don't bug me — I will be out when I'm finished."

Of course, you didn't say it loud enough for her to hear, and Mrs. Wife will inquire, "What did you say?" and you will repeat in a pleasant tone, "Just a few bugs to iron out and I will be finished," which will satisfy her for the moment.

Now that this crisis is over, it is time to mount the battery assembly in the cart. The support consists of a 1/4" steel rod 17¼" long and two 2" threaded flanges with 3/8" threaded nipples cut flush with the flange. (See Figure 1 for location of the flanges.)

Hold the flange in place and mark the holes. Drill small lead holes and then use a ¼" drill, drilling from outside in. This will prevent the exterior surface of the wood from splitting. Countersink the holes. Mount one

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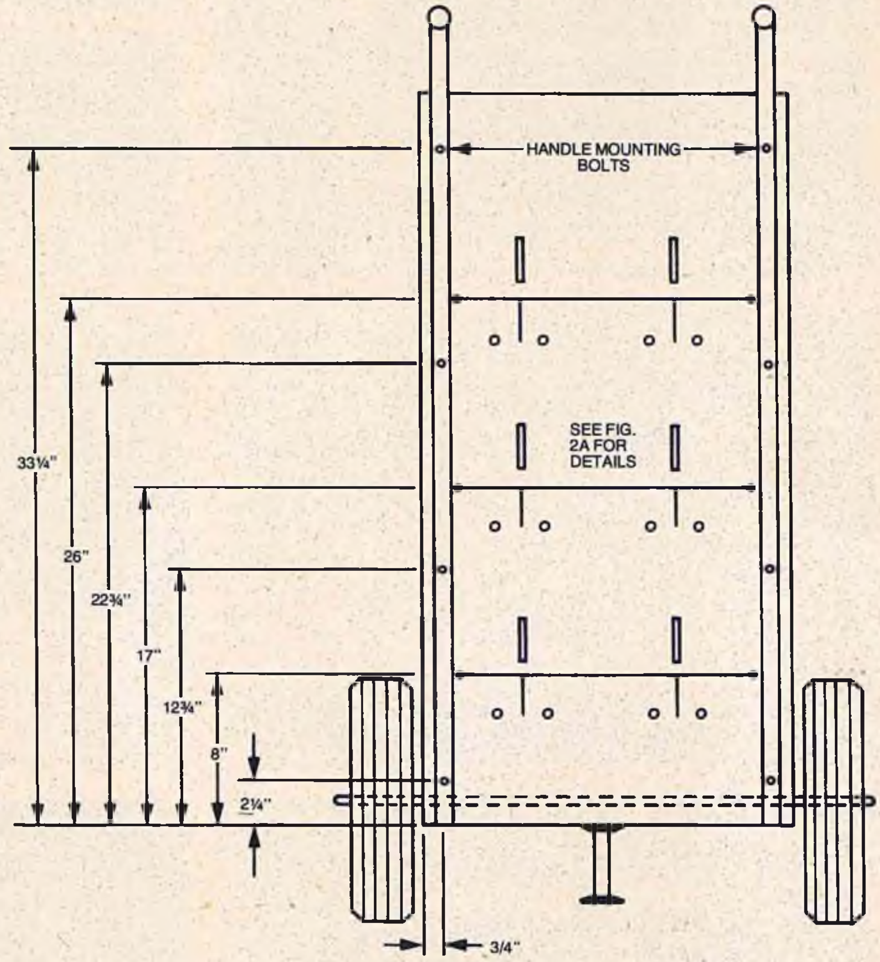


FIGURE 2

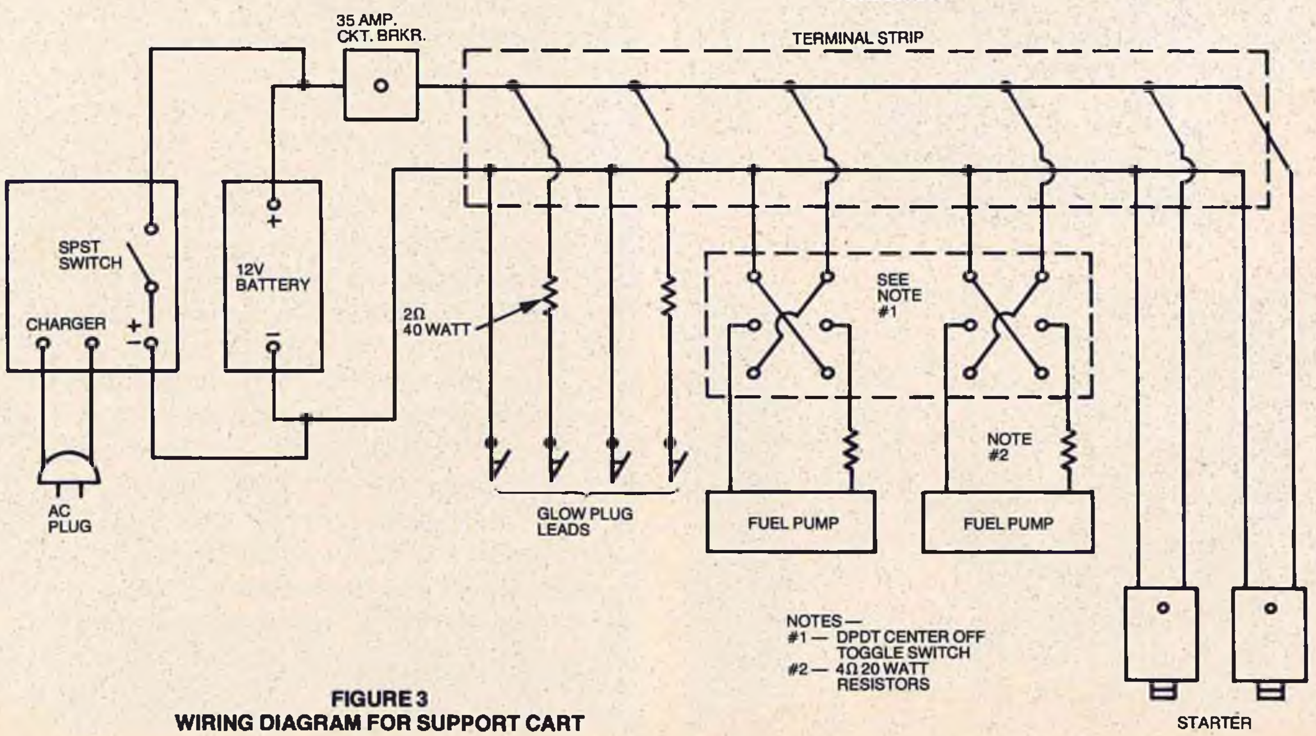
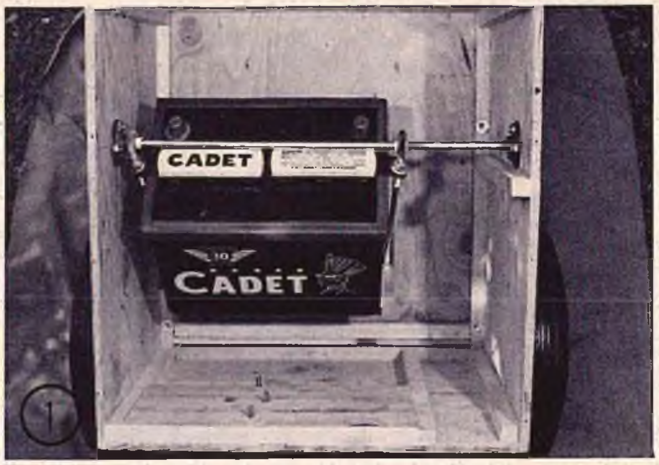
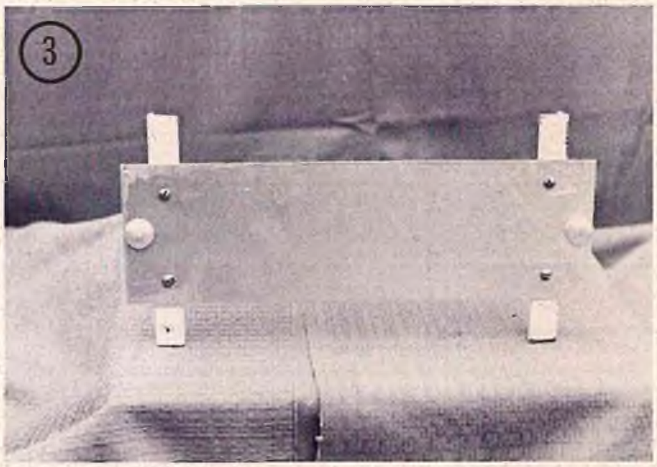
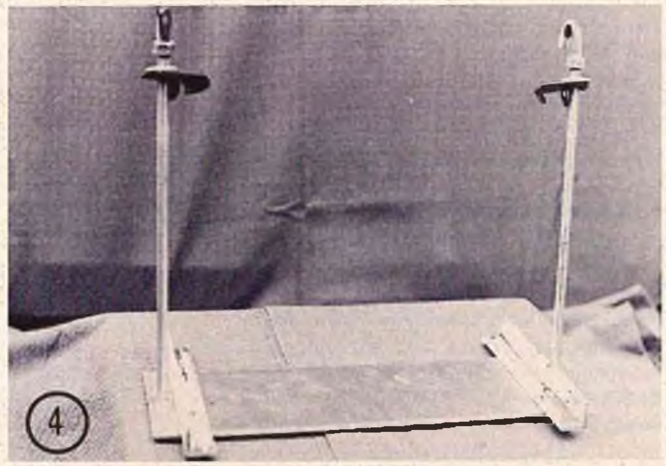
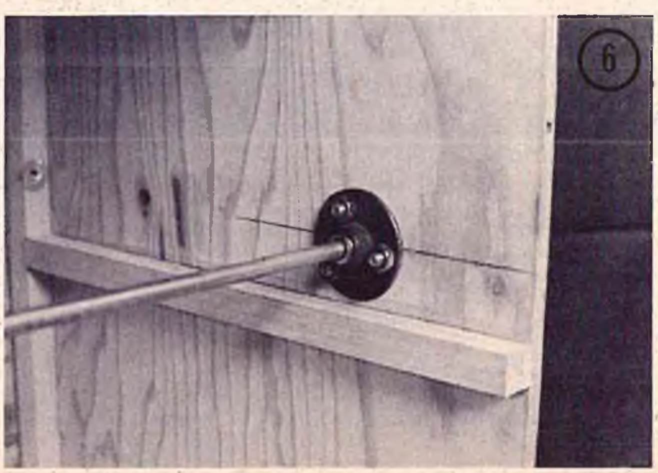


FIGURE 3
WIRING DIAGRAM FOR SUPPORT CART

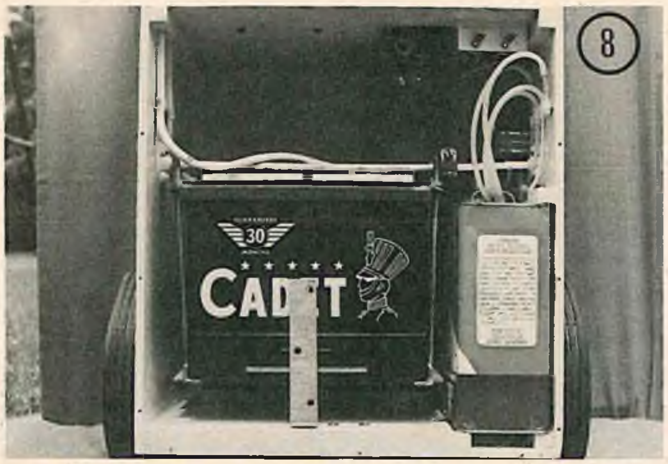




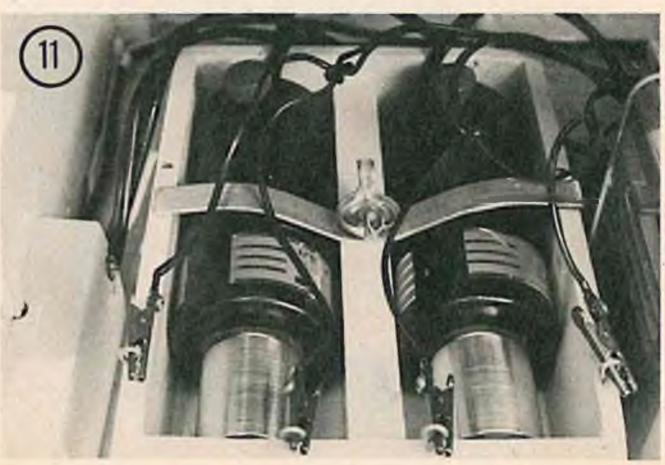


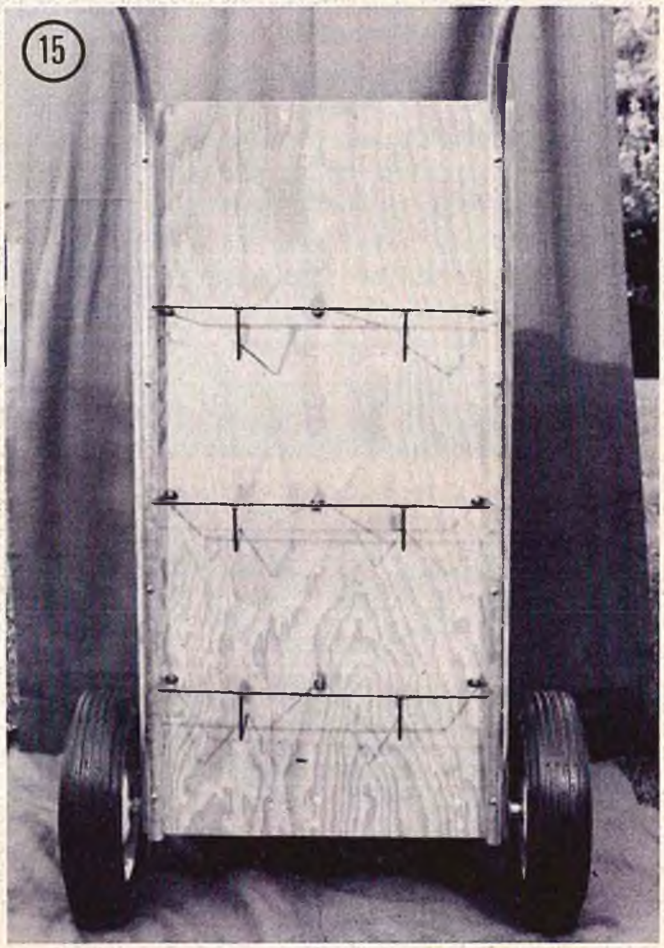


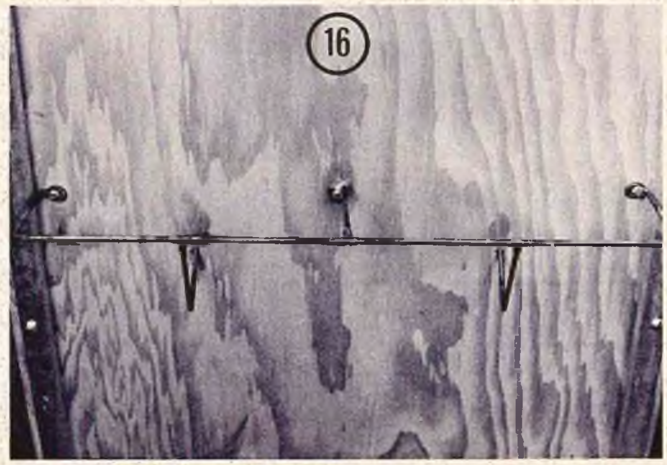
(1) Cart tilted back to show "swing" of battery. Note mounting flanges for 1/4" rod, position of battery terminals. Pine doublers are in foreground with 3/4" leveling strip for fuel cans. Also 3/4" shelf end support. Axle can be seen sandwiched between 3/4" pine strips. Bolts protruding through pine doubler are used to fasten battery swing stop angle bracket. "T" nuts used to fasten handles can be seen mounted in the vertical 3/4" strips.
(2) Drawer support brackets in place. Note 3/4" corner reinforcing strip. (3) Bottom of battery mount showing head of hold-down bolt, spacing of angle irons and angle iron mounting bolts. (4) Battery mount. Note hooks in 10" bolts. Bolts have hold-down brackets, washers and nuts installed before bending. (5) Battery in mounting assembly. (6) Right end of 1/4" battery support rod with mounting flange. Flange mounted above 3/4" pine strip which is used to hold fuel cans in place.



(7) Right side of cart showing 1/2" threaded axle in place. (8) Front of cart with panel removed, showing battery swing stop bracket, routing of battery cables through shelf, position of fuel cans and location of fuel pump switches.
(9) Fuel pumps and mounting brackets. Resistors in foreground are for fuel pumps and glow plugs. Note fuel can vents on right of photo. The front vent has the fuel line placed in it to prevent siphoning.
(10) Box with two Sullivan starters. Note center 3/4" pine separator, aluminum hold-down bracket formed over the top of the starters and held in place by wing bolt.
(11) Box with two Sonic Tronic starters. The glow plug leads are stored in the screw eyes. Box on lower left is cover for battery cables, with circuit breaker shown above.
(12) Layout of shelf showing circuit breaker, battery cable cover (in lieu of taping), starter box, battery charger and AC outlet with charger plugged in.



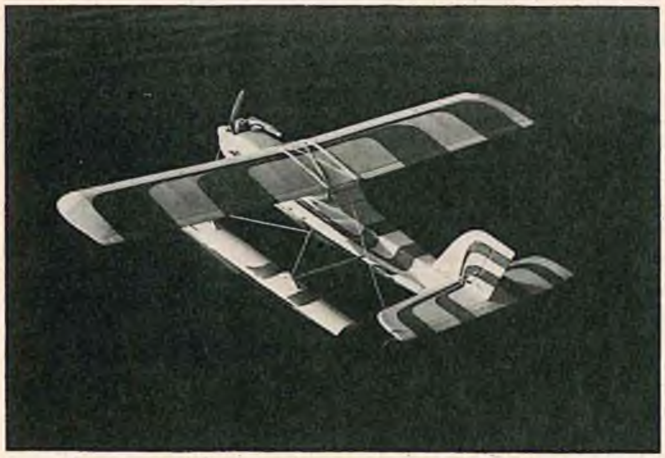




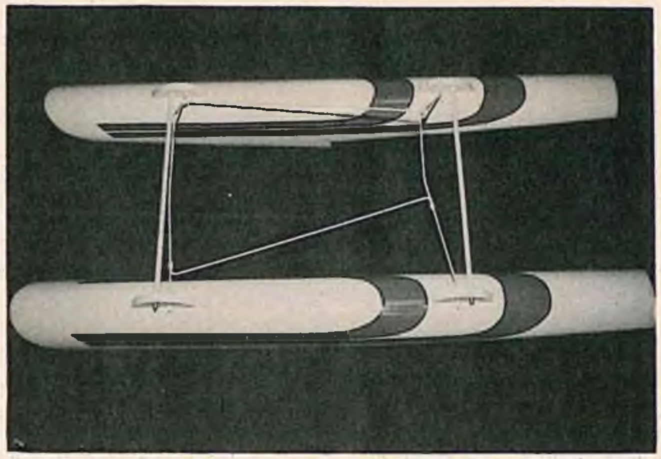
(13) Upper drawer showing compartments made from pieces of plexiglass. (14) Lower drawer sectionalized for propeller storage. (15) Rear view showing handles and transmitter brackets. (16) Close-up of transmitter bracket. Note mounting loops in music wire and silver-soldered joints. Bracket mounts betweeen handles. (17) Front of completed cart.

SUNDAY FLIER

BY KEN WILLARD



Tom Minger's seaplane - - - twin float with water rudder on one. Novel Products floats.



Top view of Novel 'Seagull' floats. Cross bars were later replaced with steel wire.

"The time has come," the wallet said, "to speak of water things - - of seaplane floats, and flying boats, and other things with wings."

So, with apologies to Lewis Carroll, and Alice in Wonderland, let's talk about "Balance in Blunderland, or Staying Right Side Up When Flying Off Water."

There's a lot of information - - and misinformation - - available on the design of seaplane floats, flying boat hulls, hydroskis, and other means of getting an airplane able to safely taxi on water, take-off from water, and land. And, with the recent RCM readership survey showing a rapidly increasing interest in this phase of R/C flying, it seemed like a good idea to look at some of the developments in water flying, review some of the old and well established factors, and look at some of the new products.

No, that's not a misprint in the first sentence. I said "wallet," and that's what I meant. Nowadays, what you can do, or can't, is directly related to the ability of your wallet to bear with the associated cost. R/C seaplane flying is neither more expensive, nor less, than any other phase of the sport. It's just that your money is spent in a slightly different way. For a glider, you have to have a winch, or a Hi-Start, or a muscular young friend to tow it up to find the thermals. For a seaplane, you need a small, emergency retrieval boat, or a muscular young man who can swim out and recover your plane if it dunks (used to do it myself, but can't stand cold water anymore). There are other variations, but that gives you a general idea.

When modelers ask me about flying off water, I tend to generalize and say "It's not all that much different from flying off land, once you get used to it." That may be an over-simplification, but, in my opinion, if you have a well designed flying boat (note I said flying boat, not seaplane), you can taxi out, head into the wind, take-off, fly around, and land just like you would if you were flying a landplane. This is also true, to a large extent, with single float seaplanes, since the single float is on the centerline and the wingtip floats come up out of the water when you get on the step. The main difference is the tendency for a single float to nose down when you apply power and the plane is at rest, so you have to counteract, at first, with some up elevator until the plane is moving fast enough to "come up on the step" and start planing on the water.

Twin float seaplanes present the designer with other problems. Since there are two, and they are off center, whenever one breaks water sooner than the other, uneven drag results, with a tendency to waterloop, or spin around on the water, often resulting in dunking. Also, when "coming up on the step," if one float happens to get an assist from a ripple of water that misses the other float, you have to be ready to counter, either with aileron or rudder, or a waterloop will result. But well designed floats make such occurrences relatively rare.

Not much has been done in models with the hydroski concept, other than some serious research by full scale plane manufacturers. It is almost a field unto itself, with problems of steering, and stability, that are quite different from the more conventional types of waterborne aircraft.

In the above discussion, I have referred to "well designed" flying boats, and seaplanes on floats. Just what is a "well designed" flying boat, or seaplane? Here, maybe, we start going around in circles, because one that performs right must be well designed — and if it is well designed, then it performs right. So how do you determine? Easy — many years ago, when I was taking courses in airplane design at Caltech, one of my professors summed it up this way, "You can design the hell out of an airplane, but until you get it up in the air, and it does what it's supposed to, you haven't designed the hell out of it, so you better get back to the drawing board and design some more. And when the test pilot doesn't want to get the hell out of it, then you've got a well designed airplane!"

I think that covers it. Just change the word to seaplane, or flying boat. It's the test results — not the theory — that counts.

The very first article I ever had published in 1932 (!) was a design for twin floats for a rubber powered free-flight. They worked well - - but they would be a complete failure on a modern R/C job. Why? Simple - - the wing loading was about 3 ounces per square foot, and when the rubber motor was fully wound, the model jumped off the water in about three feet of take-off run.

There were many subsequent designs. One of them, the Drake, was, according to Bill Winter, at that time editor of Model Airplane News, the most popular and successful designs ever to appear. Yet it was belittled by several experts in float design, because the step, instead of being under, or slightly aft of the C.G., was under the leading edge of the wing.

But I put the step there on purpose. The first version had the step just about under the C.G. — the "preferred" location, but when power was applied, the model tended to "plow" excessively, and then, when it did get on the step, it would skitter around, nose down, until perhaps a ripple would help break it loose. First, I tried correcting this by using upthrust. It helped on the water, but when it took off, the nose would go up excessively. Next, I tried moving the step forward, and I don't know exactly why, but, on that design, it worked great. I was able to take out the upthrust, and both on the water and in the air the model performed well.

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SUNBIRD

The first practical solar powered sailplane, the Sunbird will stay up from dawn to dusk on a 225 pack with no need for recharging.

By Patrick L. Mullarky

● Take a conventional tried-and-true sailplane design, build it up nice and light and strong, add several ounces of NASA technological fallout, and you have the Sunbird - - - a modified Titan-120 whose complete radio-control system, including elevator, rudder and spoiler servos, is powered by the sun!

The Sunbird carries her power source on her wings, in the form of twelve new high-efficiency solar cells. Her on-board back-up power source, a small 225 mah NiCad battery pack, is kept fully charged by the same solor cell array that powers her control system. She'll stay up from dawn to dusk without the need for recharging . . . if you can stay at the controls that long! And, she'll land with a fully-charged battery pack when she does come down! She carries enough back-up power for an hour and a half of darkness or heavy cloud cover, and she can recharge her pack from flat to full, while flying, in less than two hours. There's enough of a safety margin in her solar cell array that she will perform flawlessly even if one cell of her back-up pack is shorted. The whole array, including control electronics, weighs less than three ounces, yet will produce one-half an ampere, at 5.4 volts, as long as the sun is in the sky.

About The Author

Born in Seattle, Washington in 1941, Patrick L. Mullarky graduated from Johns Hopkins University, Baltimore, in 1963 with a degree in Engineering Science. The past 13 years have been spent in the field of Electronics and small computers. Pat is currently employed by Data General Corp. in Southboro, Massachusetts, as a Product Development Manager. A modeler since childhood, current interests include R/C and full-scale soaring, R/C system design, and state of the art linear and analog circuit design. Pat is married, with three children — the older ones just reaching modeling ages. The author's modeling specialties are biplanes, sailplanes, and 1/2A sized pattern craft.

The Sunbird project was conceived not only as a method of providing electrical power for extended duration flights, but also as a demonstration of some of the items coming down the line in the way of technological advances that are of importance to the model aviator. If all that was required was a twelve hour flight capability, all that would have to be done would be to build a sailplane to carry a pound of batteries, charge it up, and go.

No, the implications of solar power in the realm of model aviation are more far reaching than that. The features of the Sunbird listed above are part of it. The rest will come as the technology improves, and prices come down — though the prices are not too bad right now. As a direct result of solar cell usage in hundreds of satellites in recent years, solar cell technology reached a point where the Solarex Corporation was able to develop a new series of high efficiency solar cells, specifically for use on the ground, at a cost per watt figure that has put solar power within the reach of people like you and me. This project, the Sunbird, is a visible, tangible result of some of the NASA dollars spent in space research. It was a somewhat expensive project, granted. But, relative to the cost of building a special purpose sailplane, with special batteries, the cost was certainly

reasonable. More on costs later.

The design goals, in order of priority, were:

(1) The solar power source must supply at least 5.0 volts at a minimum average current drain of 300 milliamperes in full sunlight, which is enough for at least two running servos and the receiver.

(2) Provide enough on-board energy storage to handle four stalled servos (1.5 amperes) for at least one minute without damage to any component.

(3) Use any available surplus solar power output to keep an on-board back-up battery pack fully charged. Do not allow damaging overcharge to occur under any normal conditions.

(4) Provide a means of preventing the solar power source from discharging the battery pack while in darkness of heavy overcast.

(5) Provide at least 30 minutes of flight time on the back-up battery pack alone.

(6) Make it as light as possible.

(7) Keep the parts count as low as possible.

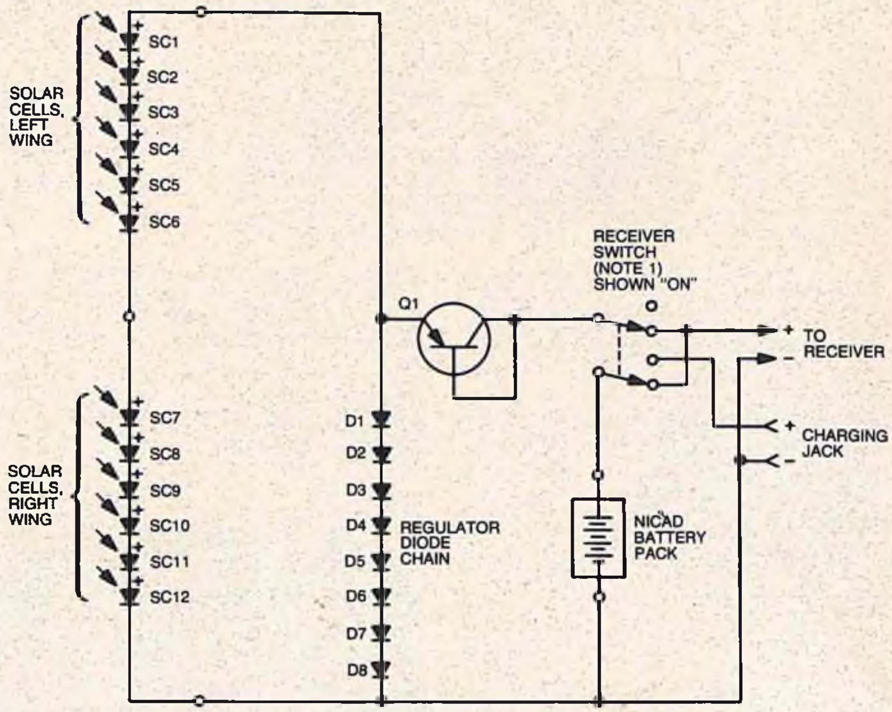
(8) Make it as inexpensive as possible.

Notice that expense is at the bottom of the list. It is at the bottom only because items 1 through 5 are critical **flight** items. If they couldn't be met, cost has no bearing whatsoever. Further, if the result was a power source too heavy to fly, then it would be no-go, also. That put expense at the bottom of the list, although it is the most **sensitive** item with regard to the true success of the project. If the end result turned out to be totally out of the reach of the average modeler, then the project would only be a "qualified" success; a "technical" success. Fortunately, all items on the list were accomplished, making the Sunbird a truly unqualified success.

Research

The first step in the project was to read up on and find a source of the new "single-slice" solar cells. (These cells are whole slices of a single crystal p-doped silicon ingot, with an n-layer diffused a few molecules deep into the surface, forming a p-n photovoltaic diode. Light falling on the surface of the diode, forms a current by creating electron-hole pairs which do not recombine due to the electric field of the junction . . . for the budding physicists among you.) The open circuit (no load) voltage of a silicon solar cell in sunlight is 0.55 volts, plus a little bit if the cell is cold, or minus a little bit if the cell is hot. Maximum power is generated by a solar cell if the load is adjusted so that the cell is delivering approximately 0.45 volts. The larger cells can produce up to 1.25 **amperes** of current at this voltage! That's over half a watt per cell, and that's no small amount of power! Costs typically run to $20.00 a watt for silicon cells in this class . . . if you buy huge quantities of them . . . and quite a bit more in small quantities. That works out to around $15,000 per horsepower, so we won't be seeing any solar powered pattern planes in the near future! But, let us restrict ourselves to the listed goals, and see what we come up with.

SUNBIRD SCHEMATIC DIAGRAM



Q1: PNP GERMANIUM POWER TRANSISTOR (RADIO SHACK 2006)
D1-D8: INEXPENSIVE 1 AMP SILICON DIODES (RADIO SHACK 276-1621)
SC1-SC12: SILICON SOLAR CELL, (+) SIDE IS BACK, OR SOLDER, SIDE. (SEE ARTICLE)

NOTE 1: THE SOLAR CELL ARRAY MUST BE SWITCHED OUT OF THE BATTERY CIRCUIT WHEN "OFF", OR THE LEAKAGE OF Q1 WILL SLOWLY (SEVERAL DAYS) DRAIN THE BATTERY PACK.

Assume a three servo sailplane, with a "standard" commercial radio-control system, like the one you might buy at your local hobby emporium. The receiver, not a "CMOS" design, would draw about 35 milliamperes (ma). Each servo would draw about 10ma when not running; about 125ma when running; and, about 300 to 350ma if stalled. A thermal sniffer draws about 18ma at 9.0 volts, so using a converter, it would require about 40ma at 5.0 volts. A radio/battery monitor would draw about 10ma. Obviously, the real variable in the total current draw is the servos. Some aircraft, such as helicopters and pattern planes, run their servos almost continually while flying. This need not be the case with sailplanes; in fact the less control input given, the better a sailplane's performance in duration. Further, we need only be concerned with the time a servo is actually running to seek a new position. A servo normally needs no additional power to hold a position once it has found its "null." (Heavy loads are an exception.) By trial and error, I have come up with following table of current requirements during one of **my** typical soaring flights. (See Table 1.)

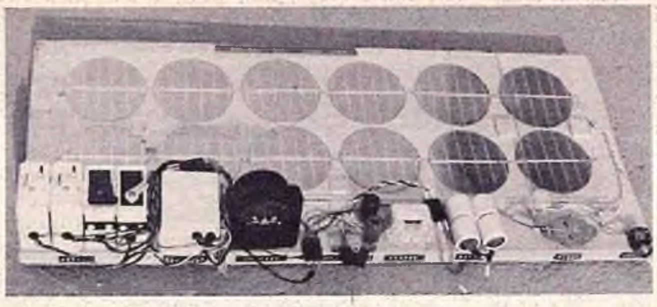
These figures result in a power consumption about a third higher than I have experienced flying my other 3-channel sailplane.

TABLE I

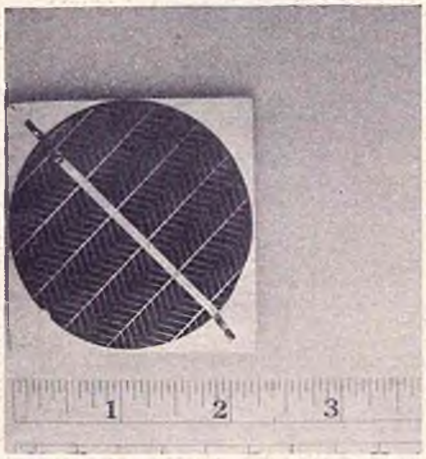
Mode	Idle (50%)	1 servo running (30%)	2 servos running (15%)	3 servos running (5%)
Receiver	35ma	35ma	35ma	35ma
Servos	30ma	190ma	305ma	420ma
Monitor	10ma	10ma	10ma	10ma
Sniffer	40ma	40ma	40ma	40ma
Total	115ma	230ma	345ma	460ma

TABLE 2

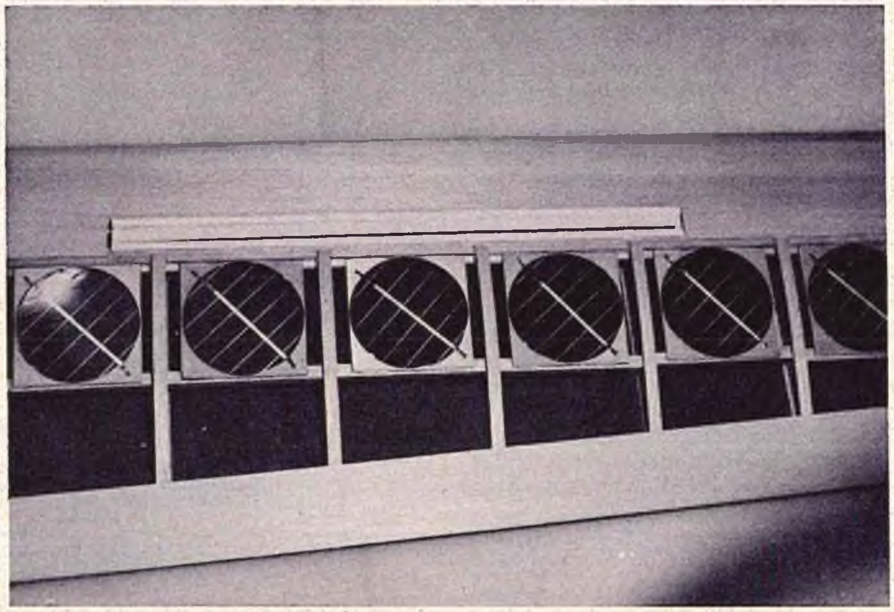
50% of the time, idle:	50% x 115ma x 1 hr. =	57.5mah
30% of the time, 1 servo:	30% x 230ma x 1 hr. =	69.0mah
15% of the time, 2 servos:	15% x 345ma x 1 hr. =	51.8mah
5% of the time, 3 servos:	5% x 460ma x 1 hr. =	23.0mah
		201.3mah

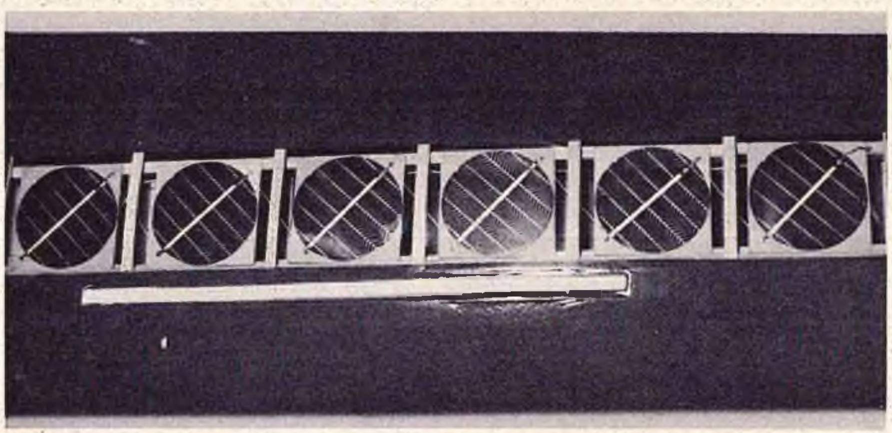


LEFT: Solar cell breadboard, top view. ABOVE: Solar cell breadboard, front view.

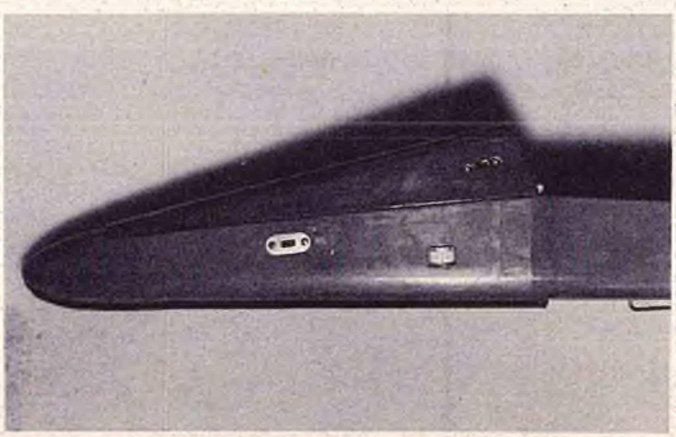


Each solar cell is mounted on a 1/16" plywood plate, measuring 2¼" square, as shown above. At right is a six-cell wing panel array mounted in the uncovered wing of the Sunbird.





ABOVE: Wing panel array showing covering. Clear MonoKote used over solar cells, colored MonoKote over balance of wing. BELOW: Side view of front of fuselage, showing small ammeter. Upper switch is the "Sniffer" switch.



If a given flight were to last a full hour, the battery drain would be calculated as shown in Table 2.

The current drain thus calculated would yield a flight time capability of 2:43 if a 550mah battery pack were used. A 225mah pack would give us about an hour of flight time, and since this is a common size, let us use this size battrey pack as our back-up/auxiliary in the Sunbird. The figures used above turn out to be a bit high for my style of flying, as I typically have a full hour left in my pack (at 100ma) after three hours of receiver-on time. Therefore, I can safely use these figures as maximums, for me, for my style of flying (hands-off unless it **needs** input to the sticks). Removing the sniffer load by running it on its own 9.0 volt battery, drops the mean load to about 160ma from over 200ma . . . and gives us almost another half hour of back-up power . . . or a greater safety margin. Even if one servo becomes stalled, or nearly so, due to a jammed linkage perhaps, there is still about a 20 minute reserve capability with the 225ma battery pack.

Now to the solar cells themselves. At a power loading voltage of 0.45 volts, we will need at least eleven cells in series (4.95 volts) to power the system. An additional cell has to be added so that the back-up battery pack can be charged in flight, as well as to provide another safety margin. NiCad cells charge efficiently at a voltage of around 1.35 volts per cell, less effectively at lower voltages. Below a voltage of 1.2 volts per cell, they don't charge at all unless they

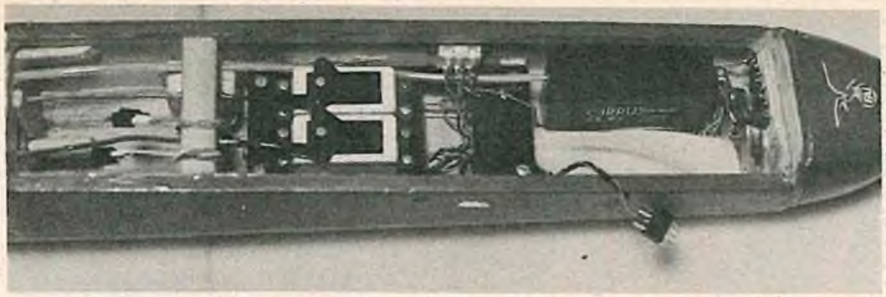
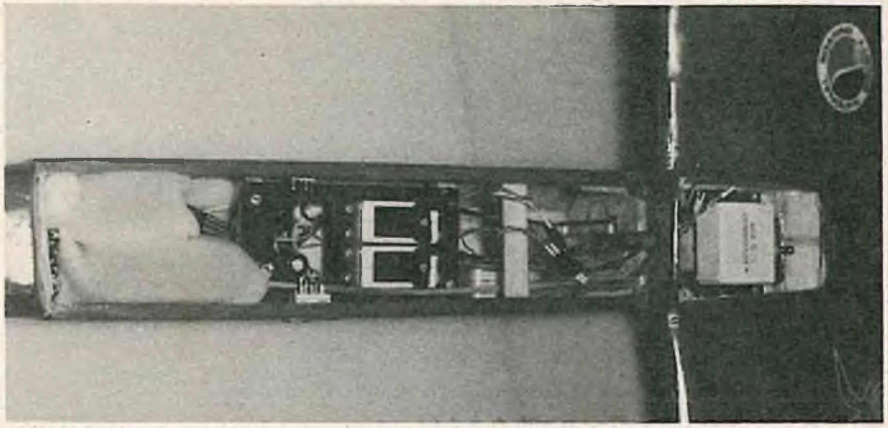


Photo at left shows complete R/C installation. The blocking "diode" and the regulator diode string are mounted on nose blocks in front of receiver.



ABOVE: View of radio compartment, showing installation. The little round item next to the radio switch in front is a capacitor added to the receiver connector. The long wires to and from the ammeter introduced too much noise, so an additional filter was added. Note spoiler servo installation in wing. BELOW: Top view of the wing center section with hatch cover enclosing spoiler servo compartment.

are completely discharged. Now twelve solar cells gives a maximum power voltage of 5.40 volts. Since our NiCad pack contains four cells, it will charge best at 4 x 1.35 volts, or 5.4 volts! Not very visible here is a small (!) technical problem: we need a blocking diode to keep the solar cells from discharging the battery in shadow or overcast conditions. This diode causes a loss of 0.20 volts in the solar cell array, so that its maximum power output voltage is approximately 5.20 volts. A fully charged NiCad, under a 0.3C load, produces about 5.2 volts. What this all says is that whenever the NiCad voltage drops below 5.2 volts, the solar cell array will take over the load, and will do so until the battery voltage rises above 5.2 volts. It's essentially a self-regulating system. There remains one more condition to bear in mind — overcharge. The output of the solar array drops abruptly at a voltage approaching 0.55 volts per cell, or an array voltage of 6.60 volts. Now, this is a voltage high enough to damage the battery pack . . . if there were enough current to actually force a voltage that high. There isn't. Nevertheless, by stringing eight "el-cheapo" silicon diodes together in series, and placing them across the solar cell array, we will prevent the array from putting out any voltage over 5.6 volts or so, for one more safety margin!

The above technical discussion leads to the simple fact that twelve solar cells are an ideal match for an R/C system operating off of a four-cell NiCad battery pack. The next step is to select **which** solar cells to use, as they come in just about every size and shape one could ever need. The least expensive of the "slice" type of cells are the round cells or partially round cells (wedges). The largest round cells put out over 1200ma . . . clearly more than needed. What is needed is about 300ma, average. I have chosen a 2¼" diameter solar cell whose output can be up to 550ma, under ideal conditions. The measured output of the array of twelve of these cells, here in New England, in the winter, is 340ma at 5.35 volts. This equals over 1.8 watts, whereas my calculated average load was 201.3ma at 5.2 volts, or about 1.05 watts. The safety margin is almost a factor of two from the wattage standpoint, and under much less than ideal conditions. Nearly half the time that was spent in the air could be under clouds, and the battery would still be kept well-charged.

From the technical point of view, the only real difficulty encountered was with the blocking diode! All readily available and cheap diodes are made from silicon. They are all excellent diodes, except for one little item: they have a forward voltage drop of 0.7 volts, typically. It would take two extra solar cells in the array just to overcome the blocking diode's forward voltage! The answer is a germanium diode, whose forward voltage is less than 0.2 volts . . . except that you can't get germanium diodes that will handle more than about 50ma, and we need to pass up to 550ma! To make a long story short, the solution was found in a germanium power transisor (cheap!) that was connected to operate as a simple diode. The voltage drop measured across the diode connected transistor was 0.18 volts at 550ma . . . just what the doctor ordered. Further, it would handle up to ten amperes, just in case.

More technicalities: an R/C system will not operate at all from a solar cell array without some sort of battery or very large capacitor across the array. While the output of the array is sufficient, indeed a great deal more than sufficient, to operate the system on the average, a problem arises from that little word, "average." Solar cells are relatively constant output devices. A servo, even when stalled, will not draw much more than 400ma, and when running, doesn't

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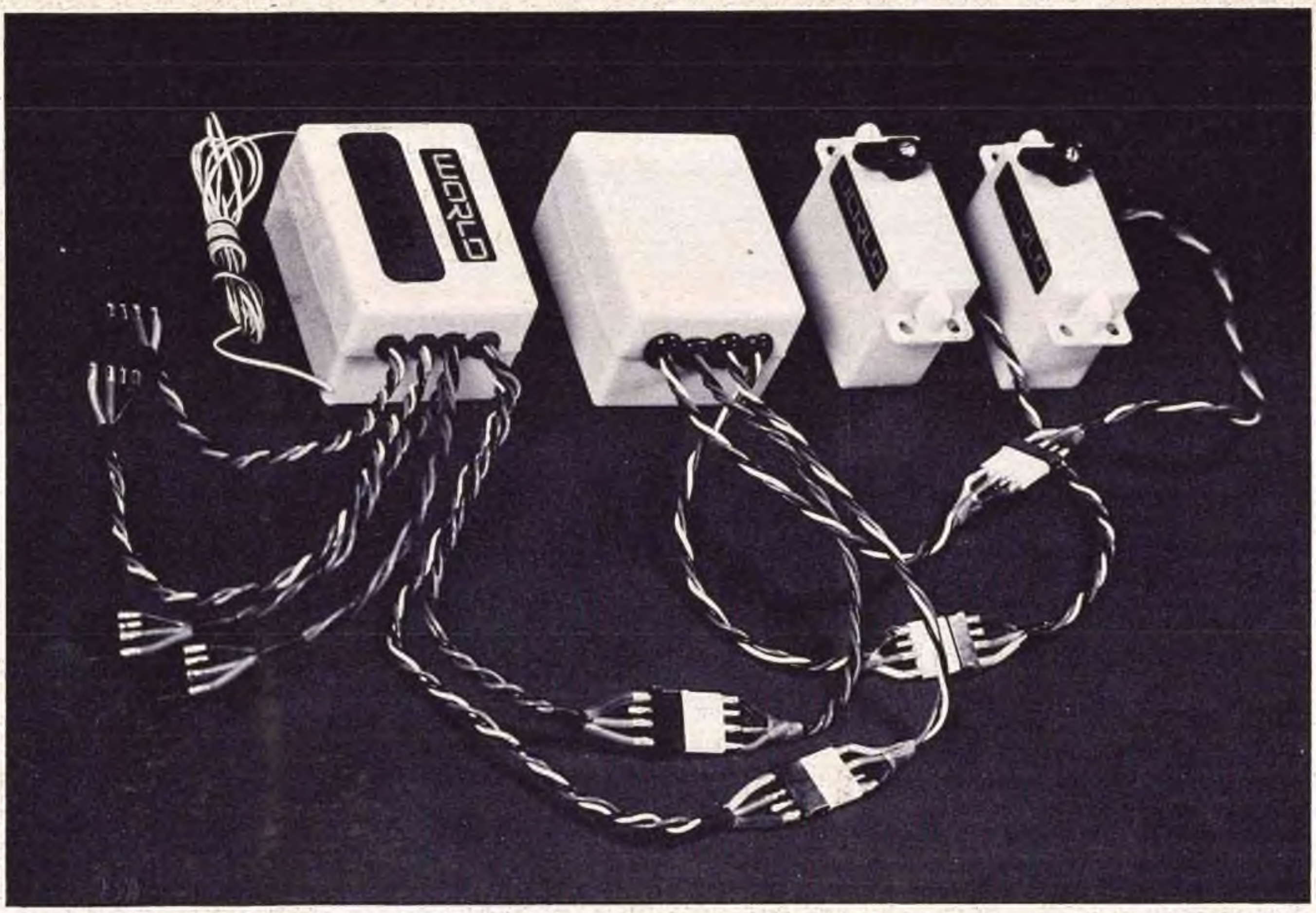
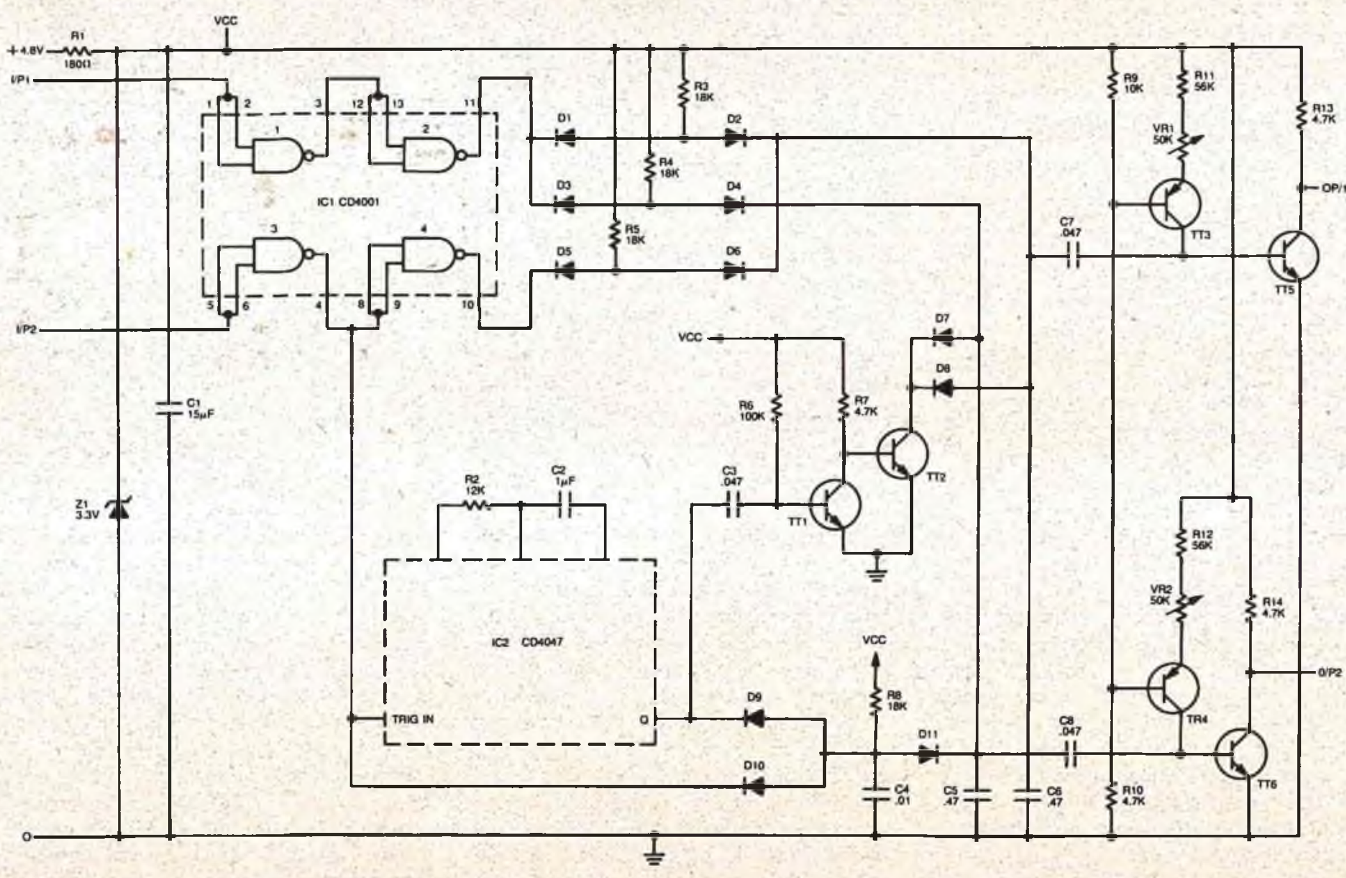


The long awaited Christy Mixer. At left is World Engines Expert receiver. Christy Mixer, in center, and two servos connected at right.



CHRISTY MIXER SCHEMATIC

CHRISTY MIXER

Designed for use with virtually any digital system, this versatile electronic mixing system can be used for numerous applications, replacing mechanical mixers. **By Peter Christy.**

INTRODUCTION

The Digital Mixer was originally conceived late in 1974 as a result of conversations between Mick Wilshere of World Engines, Great Britain, and myself. Mick was proposing to eliminate the mechanical linkages normally associated with V-tails and elevons, and replace them with a completely electronic mixing system.

Having given the matter some thought, we decided that it was theoretically possible, and set about drawing up a specification for such a device. To be a commercial proposition, as opposed to a "one-off", the mixer had to be fully compatible with as many known digital systems as possible, and it was to this end that much of the original design work was aimed.

Having decided on a brief specification, work was started on a prototype. The first prototype worked, indicating the principles of operation to be sound, but was excessively complicated, very thirsty on current, and easily upset by bumps on the power rails. The second prototype was an improvement, but the big breakthrough came on the third, with the switch to CMOS IC's. This proved entirely satisfactory, and is the version presented here.

Most of the circuitry is conventional radio control circuits,, but somewhat rearranged. However, care must be excercised in the handling of CMOS IC's and this will be gone into more fully in the constructional notes.

Preface by Mick Wilshere

This device, called the Christy Mixer, owes its birth to Peter Christy's brain power - - - it would have been stillborn without his technical background. My function, once the initial requirement or idea had been formed, was to provide the encouragement when the going was rough and to thin down the component count to the present level.

Once the design had been breadboarded and proven practical, this bread board was passed over to Peter Valentine, designer of the Lark Helicopter and notable shrinker of circuits. (His mini-classic receivers are only 1⅛" x 1⅛" x 7/8) and, in the remarkably short time of 48 hours, came up with prototype PC layouts made by hand and assembled with all components. This allowed an intensive test flying program to be put in hand and many hours flying was undertaken with a Lil' Plank (R/C Modeler plan #492) and a Vee-tailed glider. From this prototype, proper artwork and improved PC layouts were prepared and, at this time, 125 units have been made and distributed. All types of R/C systems have been used, including negative pulse systems like OS and Proline. Special details are shown for these.

Many different applications have been successfully tried out and other applications are continually coming up. So far this unit has been used for V-tail gliders; elevons for deltas and flying wings; variable camber and aileron; flaps and ailerons using strip ailerons and full span flap; and used in conjunction with 2 speed controllers for RC tanks or other tracked vehicles. The Christy Mixer has also been used for combination collective pitch and tail rotor for helicopters. The component parts are readily available from World Engines, Inc., 8960 Rossash Ave., Cincinnati, Ohio 45236.

Brief Specification

(A) Must operate from any conventional Tx/Rx combo.
(B) Must drive conventional servos.
(C) Low current consumption.
(D) Low cost.
(E) Simplicity.

By conventional, we assume positive pulses of approximately 1 to 2mS duration occurring at about a 50 to 70 Hz rate. (For negative pulse outfits see experimental notes at end.) The mixer will operate satisfactorily off SCS decoders, but servos designed for use with SCS decoders may not operate off the mixer. If you have an SCS outfit you will have to get some more up-to-date servos to use with the mixer. TTL, CMOS, etc., decoders present no problems at all.

The construction notes should present all the information necessary for successful completion of the mixer. However, for the benefit of technical experts, and to help in trouble shooting, there follows a description of the circuit operation.

Technical Description

In writing this description, I am assuming that the reader is familiar with the basic electronics circuits used in a normal RC outfit.

R1, Z1, and C1 form a simple zener stabilizer to give a rock steady supply voltage, This is essential for the correct operation of the integrators that follow.

It can be shown that the correct blend for both V-tails and elevons is a sum and difference mixture defined by the equations:

o/p1 = 1/2 (i/p1 + i/p2) ---------------- (i)

o/p2 = 1/2 (i/p1 − i/p2) + 1.5mS --- (ii)

If you try substituting values of between 1 and 2mS for i/p1 and i/p2 you will find that the outputs always lie between 1 and 2mS. o/p1 is proportional to the sum of the inputs, and o/p2 is proportional to their difference.

Actually, for reasons that will become apparent later on, it is convenient to rewrite equation (ii) as:

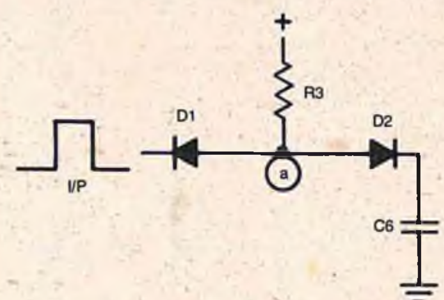
o/p2 = 1/2 (i/p1 + (3mS − i/p2)) --- (iii)

This is exactly the same equation, but rewritten in a more convenient form.

IC1 is a set of four gates. Both inputs are paralleled on each gate, so that each gate operates as a simple inverter. Being a CMOS gate, the input impedance is very high, the parallel combination offering an input impedance of about 5 x 10^5 MΩ! This ensures that not even the most sensitive SCS decoders will be loaded significantly. The gates also offer a low impedance output and a larger output voltage swing than found in TTL circuits.

Now consider i/p1. This is a positive pulse of between 1 and 2mS. It is buffered and inverted by gate 1 and then re-inverted by gate 2. The output of gate 2 is thus identical to the i/p1 except that it is now of a known amplitude and at a low impedance. This pulse is fed to D1 and D3 in parallel.

Consider now D1, R3, D2, and C6.



When the input to D1 is low, D1 is forward biased and current flows down through R3 and D1 into the output of gate 2. (Gate 2 acts as a current **sink**.) Since D1 and D2 are identical silicon diodes with the same saturation voltages, there is insufficient forward bias across D2 to allow it to conduct. However when the input goes high, D1 is reverse biased and switches off. D2 now conducts, and current flows down through R3 and D2 into C6, building up a positive voltage thereon. When the input goes low again, D1 conducts again, pulling point down to virtually earth voltage. Since C6 now has a net positive charge, D2 is reverse biased and so switches off. If the time constant R3C6 is made long with respect to 2mS, then the voltage left on C6 will be proportional to the length of the input pulse, the longer the pulse the greater the voltage.

In an absolutely identical manner D3, R4, and D4 put an identical charge on C5.

Now consider a second pulse arriving at

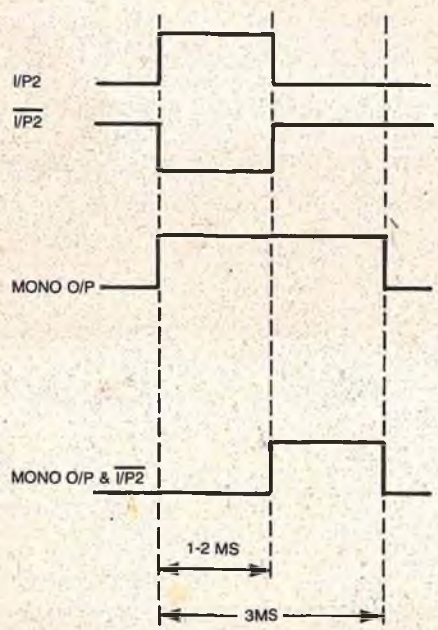
i/p2 sometime later. This is buffered and inverted by gate 3 and re-inverted by gate 4. (Ignore the other output from gate 3 for the moment.) Initially C6 has a net positive charge as a result of the previously described operation. Initially the output from gate 4 is low, D5 is conducting and D6 is off (reverse biased). When the second pulse arrives, gate 4 goes high, switching D5 off. D6 now conducts and allows C6 to charge up even further through R5. When the pulse falls to low again, D5 conducts, D6 switches off, and C6 is left with a positive charge proportional to the sum of the two incoming pulses, i.e.:

$Vc6 \propto i/p1 + i/p2$

Compare this with equation (i).

Now let's go back and look at that other output from gate 3. This is an inverted version of the input pulse. IC2 is a monostable and produces a 3mS pulse (fixed by R2C2) in response to a negative going trigger pulse. D9, D10, and R8 form an AND gate working on the output from the monostable and the inverted form of i/p2.

The operation of this part of the circuit is best shown diagrammatically. See figure below.



From this diagram it can be seen that the output of the AND gate is a pulse whose length is 3mS — i/p2. (See Equation iii.) C4 is a spike suppression capacitor in case the leading edge of the monostable output is not precisely timed to gate 3 pulse leading edge. When the output of the AND gate is low, D11 is reverse biased. Remember C5 already has a net positive charge from i/p1 as described earlier. When the output from the AND gate goes high, D11 conducts allowing C5 to charge even further via R8. When the output of the AND gate falls low again, D11 switches off, leaving C5 with a voltage proportional to the length of i/p1 plus the output of the AND gate, i.e.:

$Vc5 \propto i/p1 + (3mS - i/p2)$

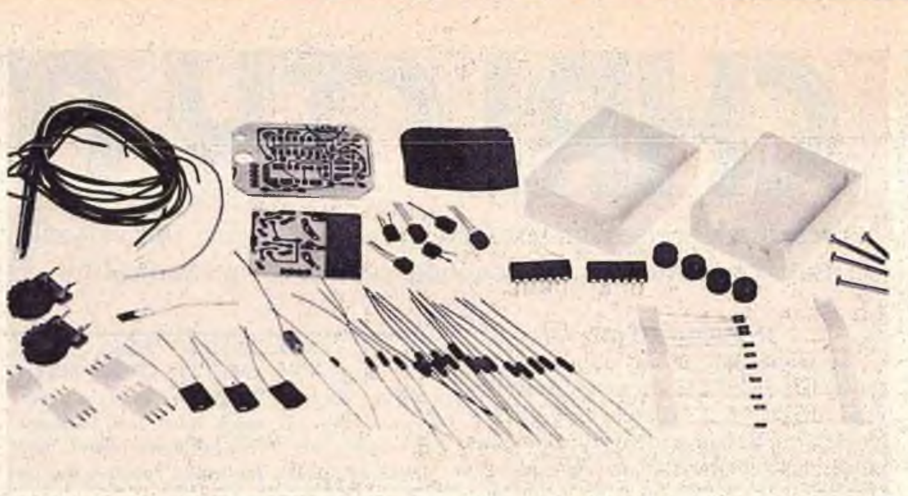
Compare this with equation iii.

Most of the difficult work has now been done and the remaining circuitry is quite straightforward. C7Tr5 and C8Tr6 are conventional half-shots as found in many transmitters. The main difference is that instead of being biased by simple resistors, they are biased by constant current sources, Tr3 and Tr4, to improve their linearity.

Tr1 is another 1/2 shot fired by the falling edge of the monostable output. The output of Tr1 is usually low biasing Tr2 off. D7 and D8 prevent charge leaking from C5 to C6 and vice versa. When Tr1 is fired, Tr2 conducts hard, discharging C5 and C6 hard via D7 and D8 in preparation for the next frame. Since the charges on C5 and C6 were proportional to the length of the input pulses, so is the amplitude of the edge transferred to C7 and C8 when C5 and C6 are discharged. Thus the length of the output pulses are governed by the charges on C5 and C6 respectively which have already been shown to be in the desired relationship, i.e.:

$o/p1 \propto Vc6 \propto i/p1 + i/p2$

$o/p2 \propto Vc5 \propto i/p1 + (3mS - i/p2)$



Complete parts kit for Christy Mixer available from World Engines, Inc.

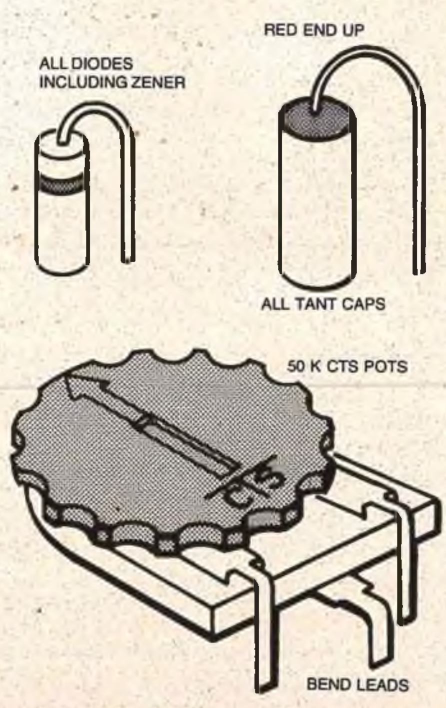


FIGURE 1

Careful choice of component values makes the constant of proportionality $\simeq$ 1/2.

So that:

$o/p1 = 1/2(i/p1 + i/p2)$

$o/p2 = 1/2(i/p1 + (3mS - i/p2))$

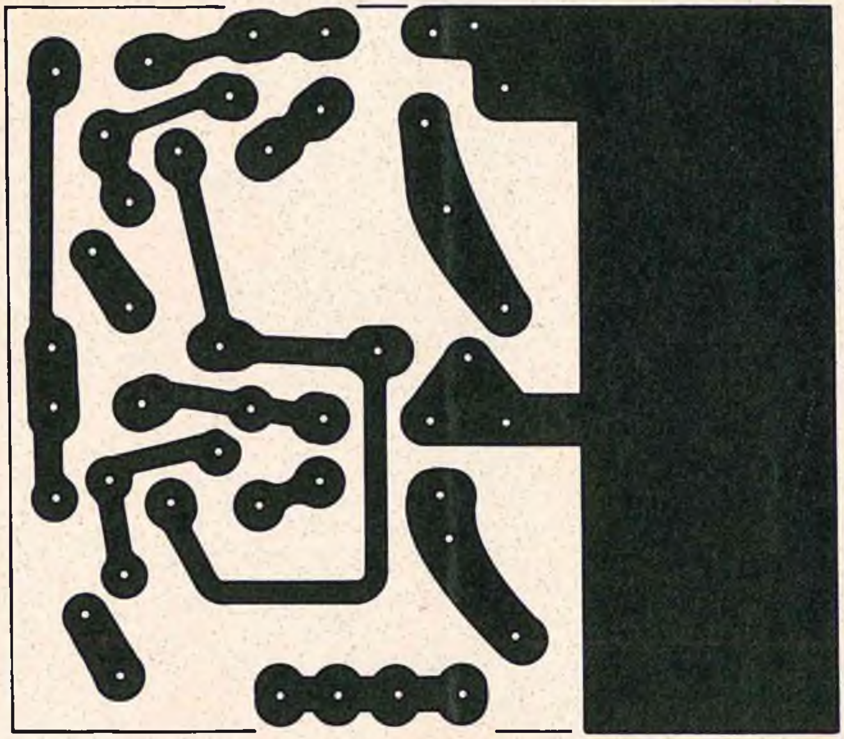
Although designed for pulses of 1 to 2 mS duration, the mixer is quite tolerant to spreads in this value. Frame rate is irrelevant.

Operational Notes

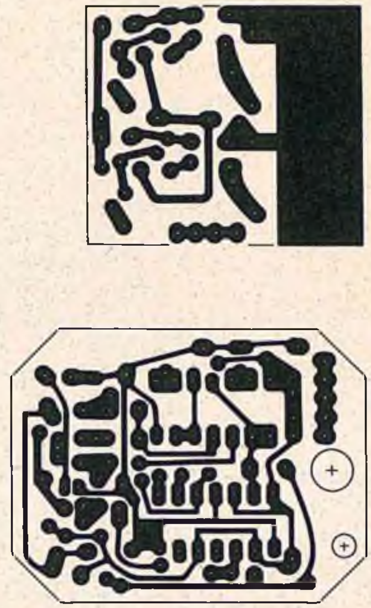
It is important that the inputs are applied to the mixer in the correct sequence. i/p1 should receive the first pulse out of the decoder, and i/p2 the second. If this is not done, no damage will be done, but there is the possibility that the mixer will not function correctly. Usually the servos only move

PARTS LIST

Description	Qty.	Source
1/4w Resistors 10%		
180 ohm	1	
4-7K	4	
12K 5% pref.	1	
10K	1	
18K	4	
68K	2	
100K	1	
50K CTS variable	2	
Capacitors		
.047 mfd. Nissi .100v	3	mylar green
.01 disc Murata 103	1	or W/Eng. disc
.10 mfd 104 35v	1	Tantaylitic
.47 mfd. CT 35	2	Comp. Inc.
15 mfd 156-10	1	Union Carb.
Semi Conductors		
RCA CD4047 AE	1	
RCA CD4001 AE	1	
BC 213L or SKB2710	2	
MPS 2924	4	
IN4148 diode	11	
Zenner 3-3v 300mw		
Hardware		
printed circuit top	1	
printed circuit bottom		
receiver case	1	World Eng.
connectors male	2	
connec. female	2	
grommets	4	
red wire	28"	
black wire	28"	
green	8"	
yellow	8"	
blue	5"	
green	5"	
orange	5"	
black	5"	
white	16"	
heat shrink tube		
1mm inside	6"	
3mm inside	1½"	



3 X 1



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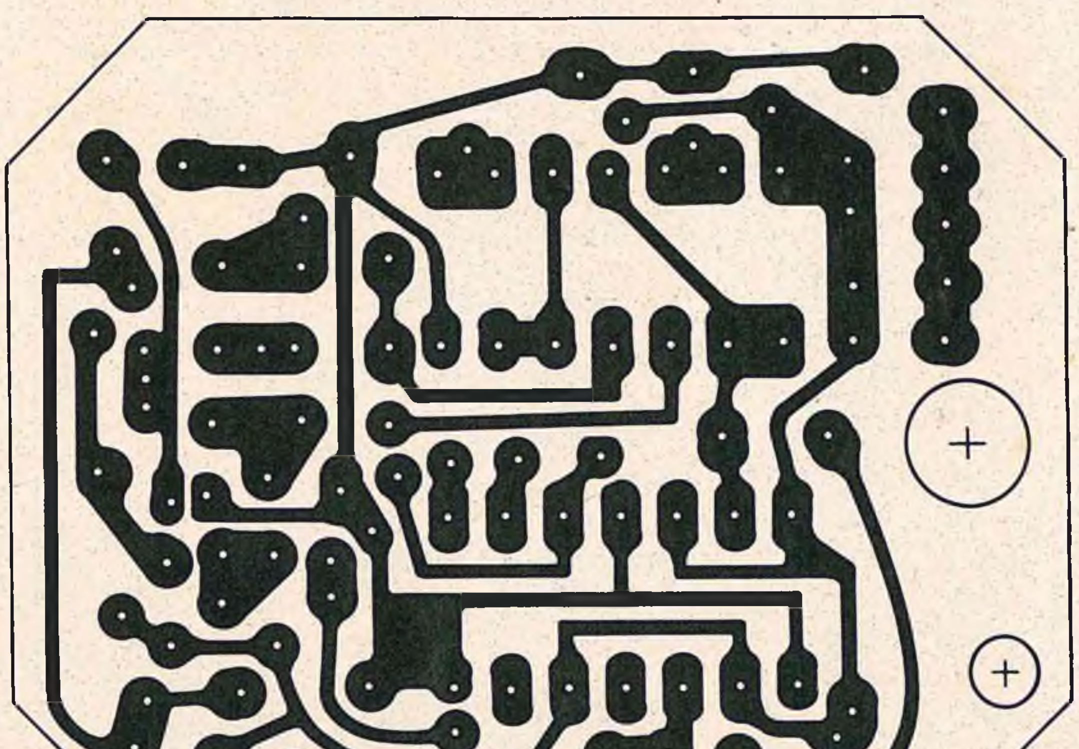
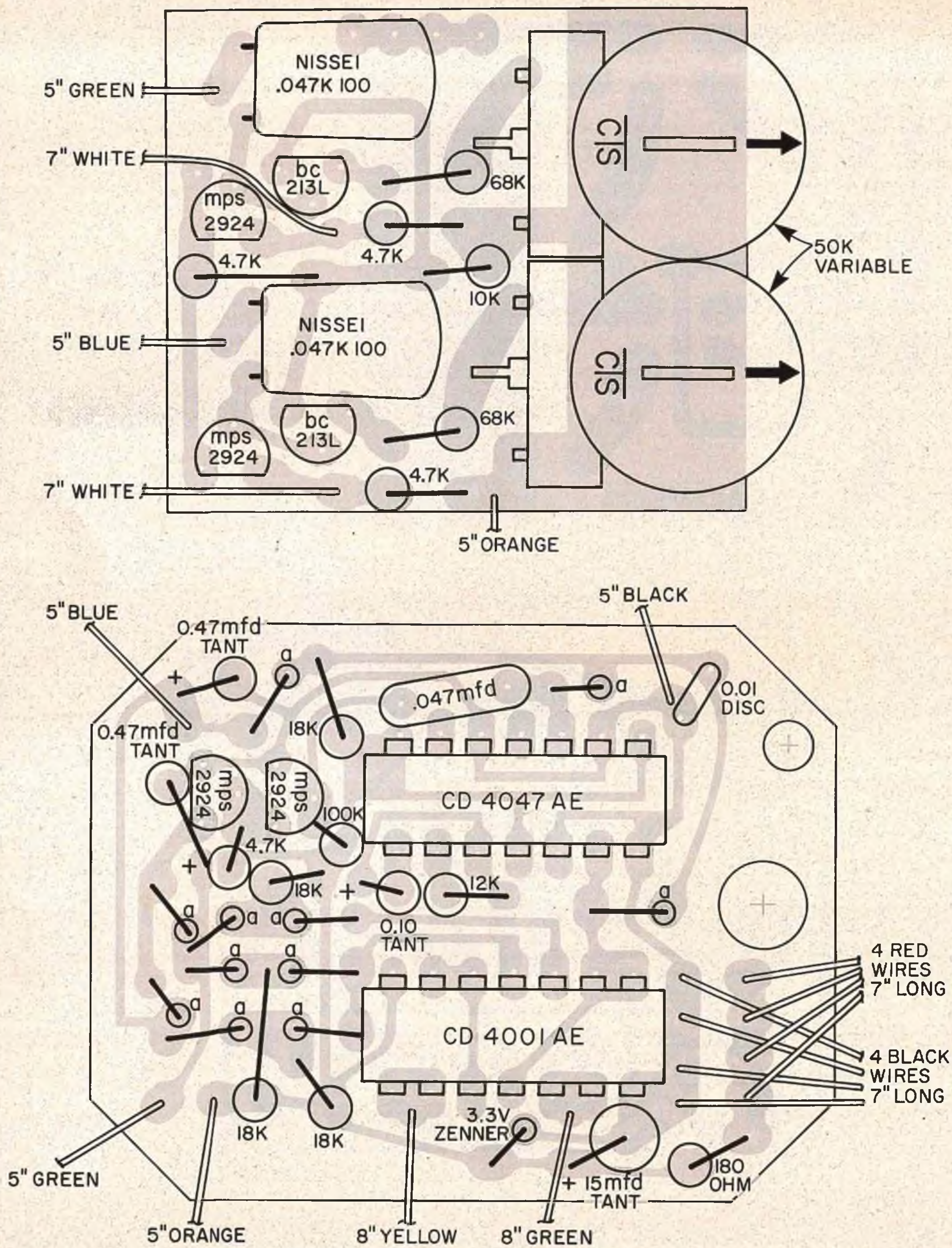


P/C BOARDS SHOWN 3 X SIZE & SAME SIZE

FIGURE 2



11 DIODES IN4148 BAR UP-MARKED (a)

FIGURE 4

one side of neutral. If you find this is the case, swap the input leads over. Some Japanese outfits identify their outputs as ch 1, ch 2, ch 3, etc., but this does not necessarily bear any relation to their transmitted sequence, so be warned! I'm afraid trial and error is the only way of establishing the correct sequence of inputs. The two pulses need not be adjacent and can be anywhere in the frame provided i/p1 receives its pulse before i/p2.

(If the two pulses are very widely separated in the frame, i.e., by more than about 4mS, they can be put in any order, so don't worry if it works alright with the inputs either way round. It just means you are exceptionally lucky!)

It is not possible to reverse the servo directions by swapping over the output leads. This must be done in the usual manner either by taking the output from the other side of the servo disc or by internally re-wiring the servo.

VR1 and VR2 are neutral adjustment pots. It is important to set up the servos so that they center accurately **without** the mixer in circuit first. Having done this in the manner suggested by the manufacturers, adjust VR1 and VR2 to give the correct neutrals on their respective servos when the mixer is in circuit.

Now go out and have fun flying, with no sloppy bellcranks in the way!

Experimental Notes

As originally designed, the mixer is set up to produce a 50/50 mix. However, there are applications where mixes other than 50/50 are desirable. For example V-tails tend to need more rudder throw than elevator.

For practical reasons it is not desirable to go beyond 70/30. Even at this the 30% function produces only a comparatively small movement of the servos, and servo resolution becomes significant. Normally, I do not recommend going beyond 60/40.

Let us assume that a 70/30 mix is desired, and that the mix is required to be the same on both outputs. (It is possible to have, say, a 50/50 mix on one output and 70/30 on the other.)

R3 sets the amount of i/p1 stored in C6, and R5 sets the amount of i/p2. It is necessary that:

$R3 + R5 \simeq 36K\Omega$

Assume that we require 70% of i/p1 and 30% of i/p2.

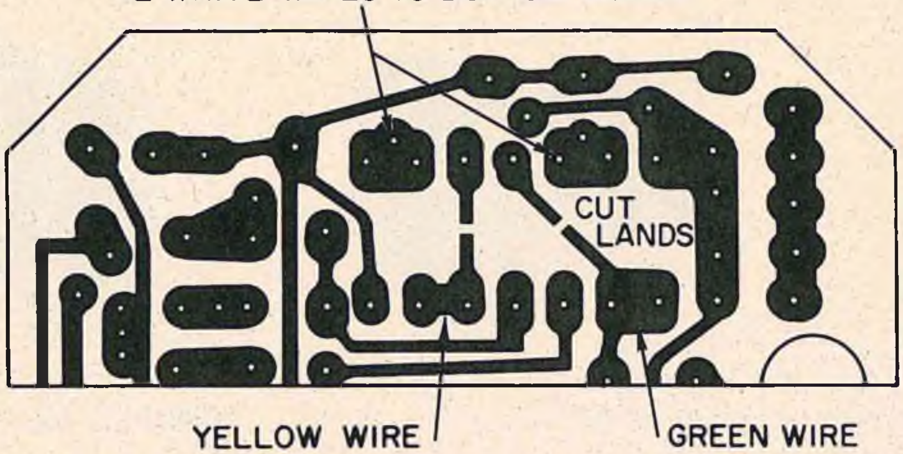
$$R3 = (100 - 70)\% \times 36K = 10.8K$$

$$R5 = (100 - 30)\% \times 36K = 25.2K$$

The nearest preferred values are 10K and 27K giving a sum of 37K. Since we want output 2 to have the same mix,

R3 = R4 = 10K and R5 = R8 = 27K

Since the sum of these resistors is no longer 36K it is possible that the two output pre-set pots will no longer be in their working range. This can be compensated for by experimentally adjusting the series resistors R11 and R12 until adjustment is reached within the range of the pots. For the values noted above, the value of series resistor required was 22K instead of the original 56K.



NEGATIVE PULSE
FIGURE 3

Building the Christy Mixer

The standard of workmanship required for this unit is well within the competent ability of anyone used to building their own gear from kits, but there is no room for any mistakes in construction or bridged lands. Any mistakes are likely to lead to the replacement of either integrated circuits or transistors.

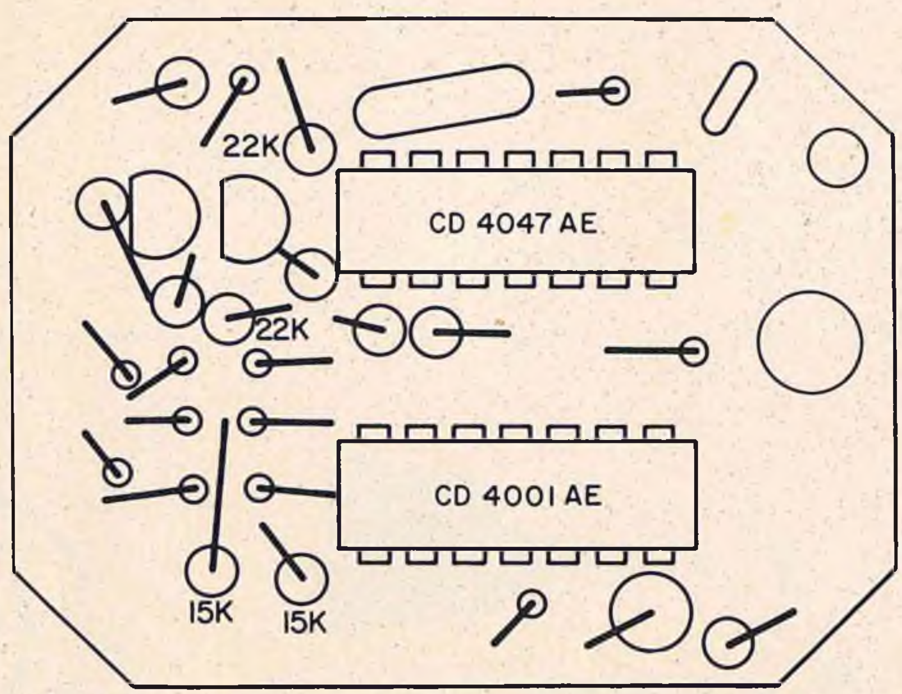
Construction is best started with the smaller board which is relatively easy to construct.

Assemble:

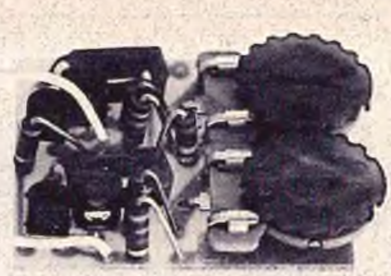
2 — .047 Mylar capacitors and solder
1 — 10K resistor and solder
3 — 4.7K resistors and solder
(not too much solder on body ends)
2 — 68K resistors

Fit:

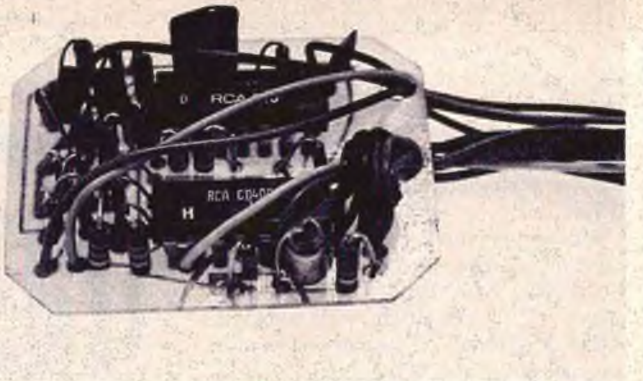
2 — MPS 2924 transistors as low as pos-



CHANGE IN RATIO OF THROW
FIGURE 5



One PC board partially wired.



Second PC board completed.

sible

2 — BC 213 L transistors as low as possible

The flat face of the BC 213L's should be tight against the .047 mylars.

Take the two 50K C.T.S. variable resistors and bend center tag so it is flat against the body and bend all three leads through 90 degrees as Figure 1. Solder in position as flat to P.C.B. as possible. Solder in two white wires 8" long.

Clean the copper side of board with an old tooth brush and dope thinner, inspect for bridged land and that wire holes are clear. If all O.K., set aside and proceed with top board.

Assemble:

1 — .047 Mylar capacitor and solder
1 — .01 disc and solder
2 — .47 tant caps red end up
1 — .1 tant cap red end up
1 — 15 mfd. tant cap
1 — 12K resistor and solder
1 — 100K resistor and solder
4 — 18K resistor and solder
1 — 4.7K resistor and solder
1 — 180 ohm.

Fit:

2 — MPS 2924 transistors and solder.

Test with resistance meter the 11 IN 4148 diodes to ensure the band end is correctly marked. Install and solder all diodes band end up and located exactly as shown on the layout. Fit the 3.3 V Zener diode and solder.

Warning: The CD 4047 and CD 4001 Cosmos IC's are sensitive to static caused by clothing, so don't finger these chips in the next stage unless you fancy doing your soldering in the same state as you were born! Using long nosed pliers longways down the IC's on the un-notched end, insert into the board and solder.

Clean the board with an old toothbrush and thinner and carefully inspect for bridged lands, and rectify any mistakes, if any. Cut and strip 4 black wires 7" long, twist the ends and insert into the board and solder. Repeat with the 4 red wires 7" long. Cut and strip 1-8" yellow wire and 1-8" green wire, then insert and solder. Cut and strip 5" long blue, green, orange, and black wires and solder in place as shown on the layout. Twist together and feed through the smaller of the holes left in the top board.

Feed 4 red wires, 4 black, and 1 yellow and green wire through the larger hole in the board.

Identify the correct holes in the lower board for the orange, black, blue, and green wires. Cut and strip these wires so as to allow the 50K pre-sets to be under the large hole, i.e., opposite ends.

Gather the two white wires from the lower board and the reds, blacks, yellow, and green; segregate into 4 looms, and thread the rubber grommet over each group.

If your outfit is an older 4 wire system, there is a center tap land spare on the bottom board — fit 4 gray wires for the center tap, if required, and thread one of each through the grommets.

Twist the looms, either 3 wire or 4 wire, together and slide a cuff of 3mm heat shrink tube 1/4" long over each. Cut 3 or 4 pieces of small heat shrink, 1mm in diameter, and thread one over each wire. Now, solder the connectors of your choice to each loom, noting that the female sockets go on the groups containing the white wires and the plugs go on the looms containing the yellow and green wires.

Preliminary Tests

If your test meter has an ohm reading scale, the resistance from red to black is 1.5K ohms and, with the meter leads reversed, 2.4K ohms. From the red wire to either yellow or green wires, the resistance is 2.0K ohms. These readings are taken with the 50K pre-sets in their mid-position (readings taken with 20,000 ohm/volt meter).

If these readings are within ± 10%, then proceed with the hook-up to your gear. If you happen to know the exact order of channel allocation from the makers handbook, then the loom containing the yellow wire goes into the decoder channel 1 and the green wire into channel 2.

Select two servos that are dead center

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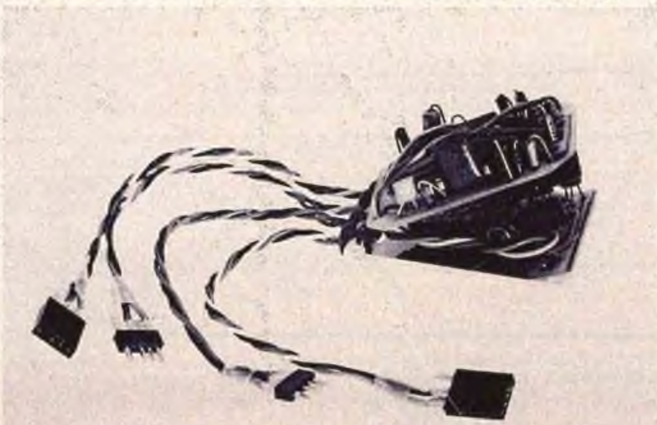
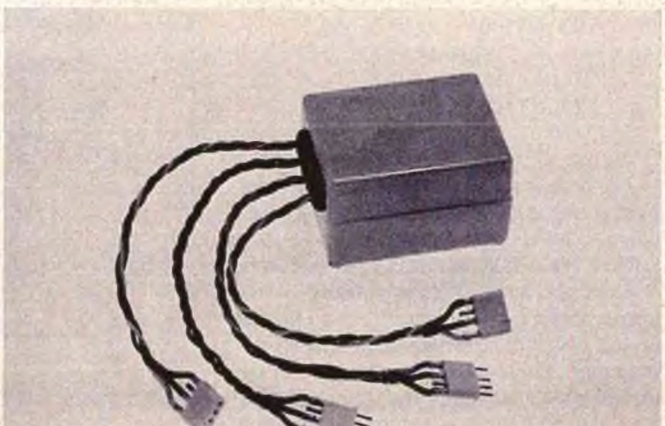
Both PC boards ready for installation in case.



The completed Christy Mixer.



All items appearing in Showcase '76 are press releases supplied by the manufacturer of the product and/or their advertising agency unless otherwise specified. The appearance of an item in Showcase '76 does not necessarily constitute an endorsement of that product by R/C Modeler Magazine.

JARMAC 4" TABLE SAW

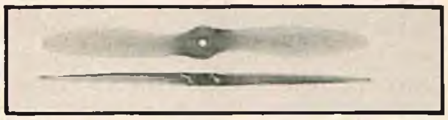
Jarmac, P.O. Box 2785, Sringfield, Illinois 62708, are manufacturers of precision tools in a size designed for model makers. As an example, their new 4" table saw comes complete with adjustable cross guide, rip fence and blade guard. It is equipped with 110 volt, 1/15 HP motor that turns 5000 rpm. The table adjusts for a 0" to 3/4" cut while the cross guide adjusts to any angle. The table top is 5½" x 7½" and no belts or gears are used. Price is $47.95. Also available from Jarmac is a 4" disc sander which is an ideal tool for precision glue joints and finishing. The cross guide adjusts to any angle. The table top is 4" x 5" and the price is $47.95.

PEANUT BUGGY R/C KIT

Another engineering marvel from Peerless/Kyosho Corporation is the Peanut Buggy R/C Kit. This unit features an exclusive reversing mechanism and is designed for an .09 engine and two channel RC system. The kit features include a durable, simplified belt drive mechanism, 4 wheel flexible suspensions, engine cooling system, built-in pull type starter, pneumatic tires, spoke type metal wheels, die-cast gear case and muffler, and all necessary parts except engine and RC equipment. It is available in two body styles — the Dune Buggy or Sport Coupe Wagon. Retail price is $69.95 each. For a catalog of the complete Peerless/Kyosho lines send 50¢ to Peerless Corporation, 3919 M Street, Philadelphia, Pennsylvania 19124.

TENSIL-X-INSTANT HINGES

Known as Tensil-X-Instant Hinges, these new control surface hinges for ailerons, elevators, and rudders make possible smoother aerodynamic flow due to minimal gap for greater flight efficiency. They are self-adhesive, and one type is attached by means of a hot iron at 350°F while another version is pressure sensitive. Both are made of high tensile strength, noise free, light weight plastic film. Tensil-X-Hinges are sold in packets containing 3 one foot lengths for only $1.50. Tensil-X-Hinges can also be used for hatches, cockpit covers and any other hinge used in model planes. This product is produced, and patents are held, by the Norton Company of Connecticut and distributed by Aristo-Craft Distinctive Miniatures, 314 5th Avenue, New York City, N.Y. 10001.



6 X 3 FIBERGLAS PROP

Are you tired of breaking the plastic props you have to use to get top performance out of your Half-A pattern or pylon job? Ace RC Inc., Box 511 B, Higginsville, Missouri 64037, has solved that problem by making available what all Half-A fliers have long awaited — a top quality, high performance, fiberglass 6/3 prop. Users indicate that they get ten times the life out of fiberglass over plastic or wood so this prop is an economical bargain plus you can get top performance from your TD engines. Put one on your Half-A right away and notice the difference. Available from Ace RC or any Ace RC dealer for $1.98 each

T-2A

D.B. Products, 20947 Hemmingway St., Canoga Park, California 91304, is back in production on the T2-A kit. The T2-A was the most popular pattern airplane in the finals of the 1974 Nationals. The T2-A kit requires mostly assembly type construction, as the fuselage, wing and stab are built by the manufacturer. The kit features a patented wing and stab fiberglass molding process that contains molded wheel wells on the retract version. The wing and stab are molded complete with tips. The fuselage is also molded fiberglass. The kit comes complete with canopy, hardware, and machine cut balsa for the movable control surfaces. Kit price of $129.95 is very reasonable considering most of the building is done by the manufacturer.

COOL POWER COMPETITION FUELS

Cool Power is a fuel that is a little different but a lot better! Cool Power fuels are cool, clean burning fuels that let your engine perform at its best and last longer. They contain all the time honored ingredients, plus a few different features that give them a different edge such as anti-foaming; a wetting action that allows the lubricant to flow more freely into bushings and bearings; superior film strength and anti-wear qualities that cut friction and allow more power with less nitro; plus a mild detergent action that helps prevent varnish even with a muffler. Cool power is offered with your choice of lubricant packages such as total synthetic or a castor synthetic blend. Available in FAI, 5%, 10%, 15%, or 25% nitro. Special rates are available to distributors, dealers, and clubs. Cool Power competition fuels are manufactured by Morgan's Hobby Enterprises Inc., 200 West Lee Street, Enterprise, Alabama 36330.

MILLICOTT CORP. PURCHASES ORBIT ELECTRONICS

Millcott Corporation, a radio controlled electronics and services company, 1420 Village Way, Unit E, Santa Ana, California 92705, was recently able to obtain all the physical assets of Orbit Electronics Corporation when Micro Electronics Testing Laboratories purchased Orbit from Charles Speer. With all the existing Orbit inventory, test equipment, fixtures, and work-in-progress, including the best of Orbit's technical specialists, Millcott Corporation has initiated its service operation which will undertake the repair and overhaul of Orbit and late model Micro-Avionics RC systems. Millcott Corporation will also act as a source of spare parts and reconditioned systems. It is their earnest intent to provide the modeling fraternity with one of the best services in this country, and, in time, will also be in a position to repair other similar systems. Mr. Donald L. Endicott is General Manager of Millcott Corporation and will be pleased to see that Millcott customers get the best of attention, all at reasonable expense.

1/4 SIZE KESTREL

Ralph Learmont, 31 Queens Parade, Burwood 3125, Melbourne, Australia, is manufacturing a sailplane kit of the Kestrel. It is a true 1/4 scale replica of the full size aircraft, having a wing span of 14' and a flying weight of 8 pounds. It has demonstrated excellent soaring performance , yet it is very easy to handle. The kit features a white gel-coated fiberglass fuselage, trimmed plexiglass canopy, foam cores for all flying surfaces, extensive hardware package, and a very comprehensive instruction manual. The model has been designed for at least 3 channel operation using elevator, coupled ailerons and rudder, plus spoilers, but, for more experienced flyers, the rudder and aileron controls can be actuated separately. Optional extra control installations for flaps, retractable wheel, and an original design retractable-releasable towhook, are fully illustrated in the instruction manual. The wing cores are grooved to take the aileron and spoiler control runs while the spoiler bay is pre-formed and the dihedral tube is pre-installed for accurate alignment. The kit is available direct from Ralph Learmont in Australia for $129.00 plus shipping charges. Box size is approximately 5'4" x 15" x 8".

PERFECT PAINT CAMOUFLAGE COLORS

Following the success of "Perfect" glossy paints, R & S Hobby Products, Inc., is introducing a line of authentic camouflage colors. The new paint comes in 16 flat colors. Matched to U.S. Standard Color Chips, these duplicate almost perfectly the camouflage paints used by the USAAF, RAF, RCAF, Germany, Japan, Israel and Egypt from World War II to the Israel War. "Perfect" camouflage paints are fuel-proof, fast drying and virtually odorless. They cover plas-

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MISS COSMIC WIND

A fast building, fast-flying Half-A pylon racer that will give you a competitive edge in this season's racing circuit. By Nate Rambo

● There is no question that any racing event is exciting. That truth is indisputable, whether the event be sports cars, airplanes, model airplanes, or any other activity. Perhaps it's the man-and-machine against "man and machine" aspect that raises the heartbeat. Whatever the cause, the electrifying result is the same for all race competitors.

Unfortunately, many model flyers have never actually tried model airplane racing, or have made only limited attempts at the sport because of the attendent problems and drawbacks in most existing racing events. Half-A pylon racing offers a solution. It is a racing event which differs from others in that it is relatively inexpensive and takes only a fraction of the effort normally required. Because of this, novice and expert flyers across the United States tried the event for the first time in 1975 and found it had plenty to offer. They found that a racer could be built in less than a week for an unbelievably low cost. The engines were cheap, could be easily started, and gave just as dependable runs as the big Schneurle forties. The models could be hand launched and, as a result, could be raced on very poor fields. Furthermore, officiating the races was simple and there was little haggling about who finished in what position. There were many other advantages to mention for Half-A racing; but, instead, let us discuss the Cosmic Wind.

Miss Cosmic Wind was designed to compete in the Half-A pylon event. The model was developed from Hirsch's scale drawings of the real shoulder wing racer (N36C). This text provides information to assist the reader in constructing and flying the model. Also provided are tips on setting the racer up to be really competitive in the 1976 pylon race circuits. It should be pointed out that the ship meets all of the 1976 RCM Half-A pylon racing rules.

The fuselage is started by cutting the sides and bulkheads to shape. They are then assembled to form a basic fuselage frame. The various stiffeners and doublers can be cemented to the fuselage sides before, or after, this fundamental assembly. A great timesaver in framing the fuselage is to use "Hot Stuff" or a similar cyanoacrylate adhesive. Critical joints should be reinforced with gussets of epoxy or a conventional air-drying adhesive prior to completing the structures.

The fuselage box structure is finished by adding the plywood landing gear mount, the top and bottom sheets, and nose blocks. Use soft wood for the balsa pieces to save weight. The fuselage is then sanded to shape either by hand or by machine. Some builders may prefer to sand the nose differently than shown so that a spinner can be used. Prior to electing that change, the builder should consider the fact that a spinner can be a source of problems. It may not run true at 20 to 25,000 rpm and it is something which may come loose in a race.

The tail group pieces are laid out and cut to shape next. The dorsal fin, vertical stabilizer, and horizontal stabilizer should be sanded and then bonded in place. The elevators should be cemented to the hardwood elevator spars. These and the fixed rudder are not added to the model until after covering.

Next, make the nuisance items, i.e., the upper and lower hatches. The plan shows that both of these items tongue, or dowel,

into place in the rear and are then held with screws in the front. The upper hatch screw goes directly into the motor mount as shown; the two bottom hatch screws secure into the landing gear mount plate. Proper attachment of the hatches is critical because they hold various components in place. The author's years and years of experience and expertise indicate that controlled flight is difficult after a hatch has blown off and a component like the flight battery has fallen to the ground!

The wing is built next. This structure, like the fuselage, is simple and can be rapidly built. The ten ribs are cut out and glued to the two spars. The leading edge and rear spar are then added. The bottom sheeting is two 3" wide pieces of 1/32" balsa butt-glued together prior to gluing to the structure. "Hot Stuff" works fine for all this bonding. It helps at this point to add some 1/16" sheet vertical webbing to tie the upper and lower spars together. This helps produce a very strong and rigid wing. The upper sheeting is then glued in place plus the wing tips. Sand the resultant assembly. Do not add the trailing edges and ailerons yet.

A lazy man's alternative to the built-up wing is the Ace constant chord wing. This can be substituted but the fuselage sides will have to be cut out slightly differently because of the different airfoil shape. Be sure to follow Ace's instructions on assembly and reinforcement of their wing if it is used. No sheet planking is necessary.

After construction of the wing assembly, it is slid into the fuselage and epoxied in place. Next, bend two aileron torque links from .075" music wire as shown. Cut the balsa trailing edge pieces to length and groove them to take the torque links. The links are put into place and the trailing edge pieces epoxied over them. Wipe the torque links with oil prior to this assembly to prevent sticking to the epoxy. The ailerons are cut to shape but are not installed at this time.

The airplane is now ready for covering. MonoKote is ideal except in the case where an Ace foam wing has been utilized. In this case, use a "lower temperature shrinking" plastic such as Solarfilm. The elevator should be installed during the covering process. MonoKote is excellent for hinging this surface. The rudder is glued in place and covered after the elevator is hinged. The ailerons may now be installed using MonoKote or regular hinges. An hour spent at this time to add numerals, decals and other decorative marking is well invested. This type of effort really changes the total appearance of any model.

After covering, fuel-proof the engine and tank compartments with some epoxy paint or polyester resin. Make, or buy, a landing gear and bolt this in place. The Williams wheels are attached using 4-40 socket head screws for axles.

No model is complete without a pilot and canopy. Be sure to add these. In fact, the canopy must be installed to meet the rules. The best way to bond the canopy in place is to run a razor around it lightly piercing the MonoKote, then press the canopy firmly in place so that it touches the balsa top block and use "Hot Stuff" for adhesion.

The Cosmic Wind is now ready for radio installation. Although most post-1969 radios will fit, the Kraft 2 or 2-3 "bricks" may cause troubles. If this type radio is to be utilized, the fuselage should be built slightly deeper than shown on the plans. Another point on radio installation is that the battery pack should be smaller than the 550 ma size in order to reduce weight. With these small models, there is always a weight battle, and it's hard to keep the Cosmic Wind weight down near the 20 ounce minimum rule specification.

MISS COSMIC WIND
Designed By: Nate Rambo

TYPE AIRCRAFT
1/2A Pylon
WINGSPAN
31 Inches
WING CHORD
6¾ Inches
TOTAL WING AREA
209 Square Inches
WING LOCATION
Shoulder
AIRFOIL
Symmetrical
WING PLANFORM
Constant Chord
DIHEDRAL, Each Tip
None
O.A. FUSELAGE LENGTH
27½ Inches
RADIO COMPARTMENT AREA
(L) 5¼" X (W) 2¼" X (H) 1⅝"
STABILIZER SPAN
12 Inches
STABILIZER CHORD (incl. elev.)
4 Inches (Avg.)
STABILIZER AREA
46½ Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Mid-Fuselage
VERTICAL FIN HEIGHT
5¼ Inches
VERTICAL FIN WIDTH (incl. rudder)
3¼ Inches (Avg.)
REC. ENGINE SIZE
Cox T.D. .049/.051
FUEL TANK SIZE
1 Ounce
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
Two
CONTROL FUNCTIONS
Elevator & Ailerons
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa and Ply
Wing	Balsa
Empennage	Balsa and Hardwood
Weight Ready-To-Fly	20-24 Ozs.
Wing Loading	13.8-16.5 Oz./Sq. Ft.

It is important that the controls of any racer be rigged for proper sensitivity. The amount of movement is a compromise which provides enough low speed control for landings without providing too much control during the high speed flight. Therefore, the Cosmic Wind control linkage geometry should be built so that full elevator travel is approximately 1/4" in each direction from neutral. Proper aileron travel should be approximately 1/8" in each direction.

The next subject is engines. The engine used most in Half-A pylon racing is the Cox Tee Dee .051. This is a jewel of an engine, but it must be modified for pressurization prior to installation in the Cosmic Wind. The modification is a simple process which is fully described in section "E" of the Cox operating instructions supplied with each Tee Dee. The instructions also provide invaluable information about removing gaskets to increase compression, removal of varnish, and other operating tips.

There are many minor things which can make an engine run well. First, remove the screen over the venturi. Next, substitute a Kirn needle valve assembly for the Cox assembly (Kirn also makes a pressure back-plate). If a friend is good at reworking engines, have him check the piston and cylinder fit.

Another avenue to a good engine, and probably the best, is to buy one of Dale Kirn's custom engines. These engines are loosened-up and polished for racing. They really turn out the power with little break-in required. A Kirn engine and Fox 40-40 fuel is a hard combination to beat.

When it comes to fuel tanks, the Sullivan SS-2 is just about the right size. Its rated capacity is one ounce but it actually holds more than the round tanks of the same rated capacity. Install a fixed fuel pick-up tube placed at the bottom so the model can be rolled inverted to kill the engine. Then install a single vent line direct to the engine pressure fitting.

A little experimentation may be required to find the best propeller. The Cox 5/3 grey rigid plastic propeller is a good one to start with. It lets the engine turn close to its rate peak power rpm (22,500) and holds its shape better than the black flexible types.

Some flyers, particularly those experienced with big engines, disrespect Half-A engines because of starting troubles and inconsistent runs. The pressurization will correct the inconsistency of runs and cause the engine to peak throughout flight. The best way to overcome starting problems is to use an electric starter. Just prime at the exhaust, pinch off the pressure line with your fingers, and crank with the starter. Be sure to flip the prop once or twice by hand to insure that too much fuel is not in the cylinder prior to using the electric starter. The connecting rod could be bent if this is not done.

When first flying the Cosmic Wind, the modeler should be patient, particularly if he is not accustomed to the Half-A size machine. It takes two or three weekends to really start to handle the engine and aircraft with any degree of familiarity.

There is one final idea which should be brought out. Persuade some fellow club members to take a few evenings to build

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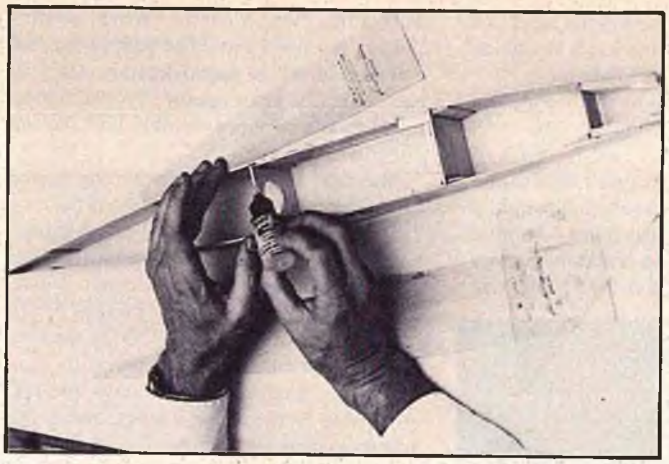
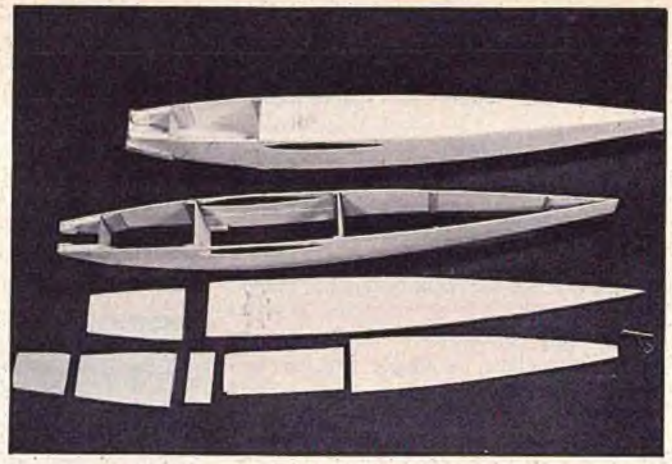
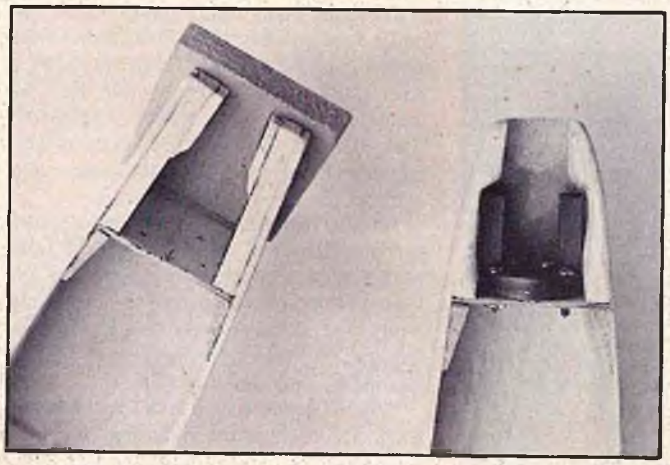
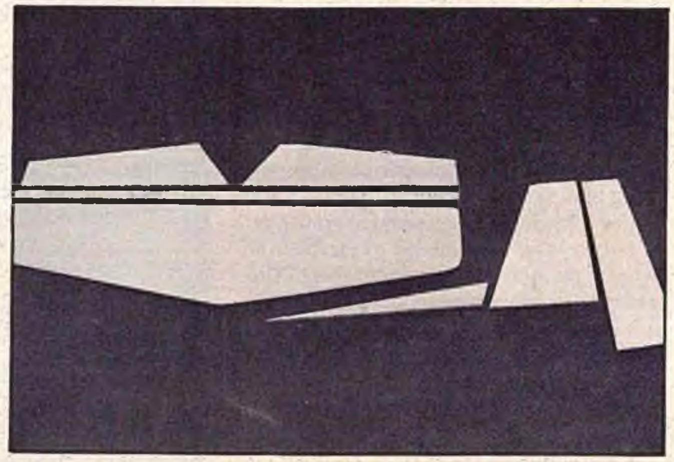
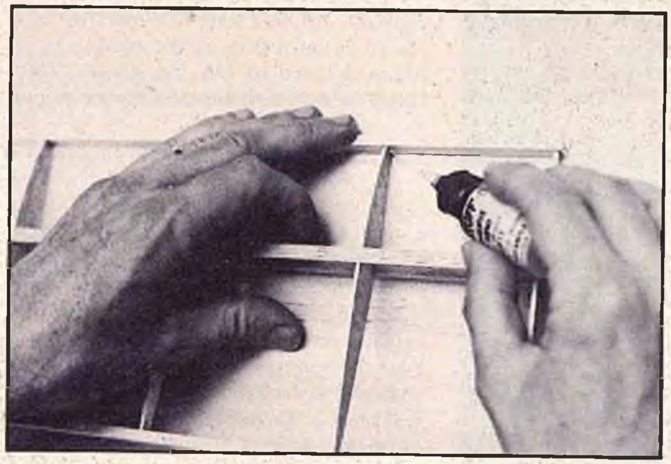
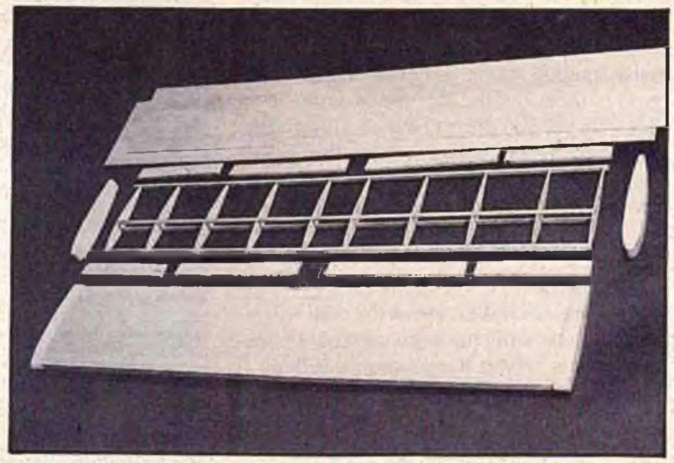


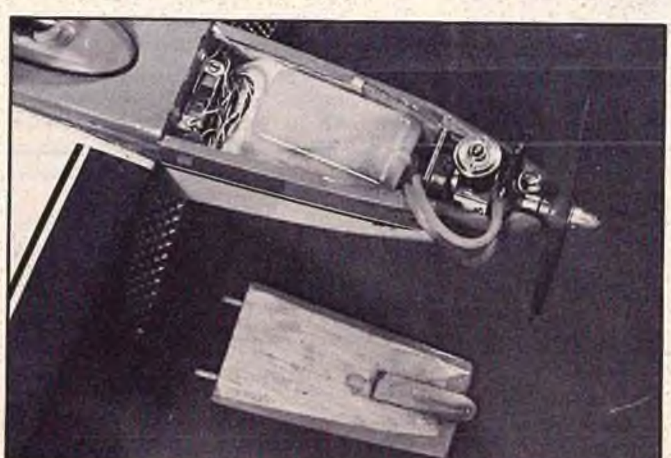


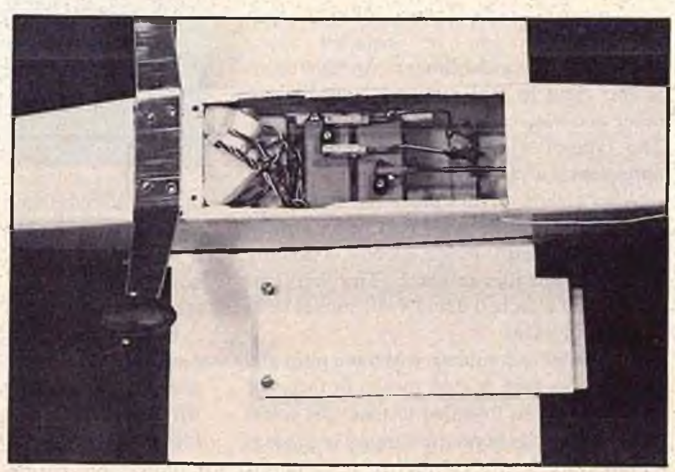




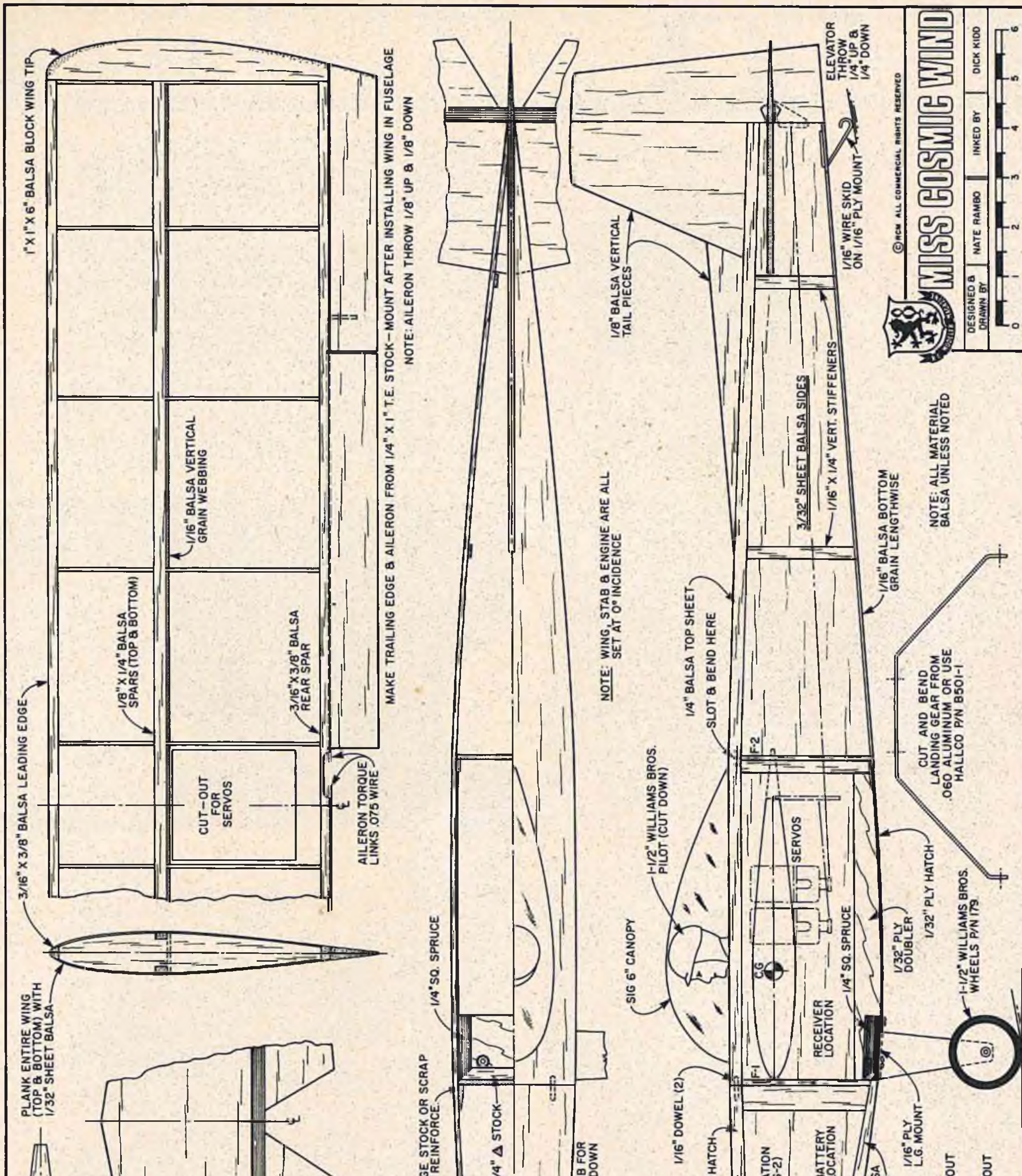








FULL SIZE PLANS AVAILABLE — SEE PAGE 195



from page 10

. . . ification of sub-piston induction were holes drilled in the cylinder wall that were uncovered by the piston skirt when at the top of the pistons stroke. This method of free porting allowed only fresh air undiluted with exhaust gasses to be drawn into the engine. (Along with any dirt or foreign matter in the air, naturally!) Certain models of the old Super Cyclones and Orwick .64's used the drilled hole method of sub-piston induction.

But, getting back to the Howler, we have an entirely different design approach. The Howler does have a needle valve and fuel passage in the bottom of the crankcase. The crankshaft has a milled port much the same as a conventional front intake engine. A series of holes are drilled around the outer diameter of the crankshaft disc that connects with a larger hole leading to the milled port. The normal hole through the crankshaft is plugged so that all fuel introduced into the engine is by the series of holes around the outer diameter of the crankshaft disc. This is a patented "fuel injection" system. The raw fuel from the spinning crankshaft is then mixed with the air being drawn through the exhaust in the crankcase.

This method has several disadvantages such as the limited duration of the air intake, poor mixing of the fuel/air, etc. Every engine sold was bench run and had to obtain 18,000 rpm. However, it was never stated what size prop was used. The engine did run very well but was no match for the other high performance engines of the day such as the McCoy, Hornet, Super Cyclone, etc. In 1947, just before going out of business, a small air intake was incorporated with the needle valve in the conventional manner and the sub-piston intake duration was shortened slightly. This helped the performance of the engine slightly but not enough to make any significant difference in the performance.

The balance of the engine was of conventional design. An aluminum piston with two piston rings, a double ball bearing crankshaft, and timer with automobile type points as used by many racing engines. The engine had a bore of .9375 and stroke of .875 for a displacement of .604.

The exact number of Howler's made is not known but it is generally agreed that the number did not exceed 300. Bone Tool and Gauge Co. had tooled up to produce 10,000 engines. 300 engines at a tooling cost of $50,000 would make the Howler one of the most expensive engines from a production standpoint of all time. The actual selling price of the engine was $34.95!

So that's the history of another old timer. We'll have another for you in a few months. Now, let's answer a few letters.

Dear Mr. Lee,

After reading your Engine Clinic, in the February 1976 issue of your magazine, concerning the Perry Directional Porting, I was very pleased when you mentioned you had modified an OS Goldhead. I was even more pleased when you said it was possible for one to do the porting himself. Alas, I was greatly disappointed when you failed to mention how one could go about getting the specifications for doing such a thing if possible. I would like to incorporate PDP into my own Goldhead. I, fortunately, have the proper tools and machinery for doing this and am simply waiting for the "know how". I don't know whether the exact specs are a closely guarded secret among you or not, but I would certainly be grateful if you could give me the dimensions of the slots

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SUNDAY FLIER

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dunk your radio. The foam cores are of high quality and can be used as is from the kit.
Negative: Some of the sheeting supplied was split. Think it was due to the packaging. Don't like the wire for struts. Think it should be changed to sheet aluminum. Wire is too difficult to bend accurately to achieve proper angle between wing and floats. Wire also does not appear to be very sturdy. If sheet aluminum is not supplied, the kit should at least contain the grooved blocks for attachment to fuselage. These blocks are most difficult to obtain without purchasing an entire landing gear set.

Since there were some negative comments by Tom, I sent them to Bill Westphal, at Novel Products. Obviously, he isn't going to take exception to all the nice things Tom said!

Bill's response was pretty much what I had anticipated, namely, that the main reason for doing things the way he did was to keep the cost down, although there are other points. The wire gear is cheaper than aluminum, and can be formed to fit your own individual design, thus avoiding all the shimming and fitting that pre-bent aluminum would require. Also, unless the aluminum has been properly treated, it is too soft to take the beating. As for the grooved blocks, Bill pointed out that strips of 1/8" ply, epoxied to 1/4" ply, with a 1/8" gap, can quickly be made for a lot less than the commercial blocks. It is again a matter of cost.

In any event, after Tom finished the set and installed them, we went out and test flew the combination. Water handling was excellent, with the water rudder making sharp turns very easy even at idle. Tracking for take-off was true, and the plane lifted off the water easily. There was a slight tilt to the right as the floats lifted clear, caused by the water rudder being located on the right float, but it was easily controlled. The water rudder could be a bit smaller and still be effective — some manufacturers even dispense with the water rudder and depend on power bursts against the air rudder to turn the aircraft. An alternative, which Tom plans to try later, is a fixed water fin on the other float, to equalize drag at lift-off.

In summary, then, if you want to install a set of floats on your .60 powered sport plane, then, in my opinion, you will be well satisfied with the Novel Products design. Just be sure to follow the alignment instructions provided.

It is interesting to note that Sure-Flite Floats, which were discussed in the April RCM, show a different alignment — and there's a reason. The angle at which the forward part of the bottom of the floats meets the step, and that aft of the step, are flatter; also, the step is not quite so deep. Thus, there is an action more nearly approximating that of water skis with the Sure-Flite floats than with the Novel Products design. There are other differences — Sure-Flite floats are for smaller models, and the kit contains less hardware — no wire or aluminum; you make your choice, then go buy it separately.

There will always be differences of opinion regarding float design. As far as I am concerned, the differences are not significant, so long as the results are satisfactory to you, the modeler. My personal preference happens to be for the single float with tip floats, or the flying boat hull. But, if twin floats appeal to you, and you've got a .60 powered landplane you want to convert, try Novel Products Seagull design. It's a good one.

So, go float your boat, take it off, and then fly your kite. □

AMA FIELD CART

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flange using 3/16" x 3/4" FH bolts. Put a steel rod in the mounted flange, slip a 1/4" ID collar on the rod, place the remaining flange over the other end of the rod, slip into place, and fasten the same as before. Hang the battery assembly on the steel rod and slide to the extreme left. Move the collar against the right battery hanger and secure. Now, slowly tilt the cart backwards and observe the battery. It should move smoothly without binding. If it jams, find your problem and correct because battery acid can cause one heck of a lot of damage. Notice in the photo that there is an angle bracket mounted in front of the battery. This is to keep the battery from crashing through the front panel should the cart be stopped suddenly or stood up too rapidly. The bottom of the bracket is bolted through the 3/4" pine doubler and the base of the cart using 1/4" x 1¾" bolts; again, countersink the bolt heads. The vertical part of the bracket is flush with the front edge of the cart. Once satisfied that everything is "Jake", loosen the collar and remove the battery assembly.

Refer to Figure 1 and locate the holes for the axle. Drill these holes using a 1/2" wood bit. Make sure that none of the wood screws used to fasten the pine supports are in the way. If they are, remove them. The glue will provide adequate support. The axle is a 1/2" x 36" threaded steel rod cut to 25¾". Put the axle through the holes and center it. The axle should rest on top of the lower rear 3/4" reinforcing strip. Place a 3/4" strip firmly against the top of the axle (forming a sandwich) and fasten in place using screws and glue. Next, put a washer and a nut on each end and tighten. Place the wheels on the axle, then another washer, and finally a nut. Tighten the nut enough to hold the wheel securely. If the wheel does not spin freely, loosen the nut until it does. If all is okay, remove the wheels, otherwise you will be chasing this stupid thing all over the workshop when you try to perform the remaining steps!

The fuel supply consists of two one-gallon cans mounted in the lower right hand side of the cart. The wide side of the can is flush against the right side of the cart, with their bottoms resting on the 3/4" corner reinforcing strip. So that the cans will

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. . . . Gel/Cell batteries.

I have been using Gel/Cell batteries, industrially, for some years now and have tapped these batteries many times, quite successfully. The advantages of being able to access the individual cells out-weigh the disadvantages and with a reasonable amount of caution and some added rules for recharging, it can be done.

Mr. Sullivan is correct, tapping the interconnecting links does require some care. I have used two methods:

(1) I drill, at the center of the link and only deep enough to go slightly through the link, with a drill approximately 0.01" smaller than the size screw I intend using. The screw, then threaded into the hole will cut a thread 0.005" into the epoxy and link with sufficient mechanical and electrical integrity. I usually use a 4-40 size thread.

(2) With a knife, I remove the epoxy from over the connecting link, and then simply solder a terminal to the link. This method is considerably more difficult and requires a soldering iron large enough to do the job quickly without doing damage to the cells at either end of the link.

With regard to discharging one cell excessively with respect to the others, this can be overcome by rotating the use of the cells. If you tap all cells, you can then use one cell for a short time switching to another and another so that the average discharge on all cells is approximately the same.

When recharging the battery, charge down to the minimum charging current (as specified by the manufacturer) and hold it there. Since all the cells are available, you can monitor the cell voltages until each is up to the full charge value. Or charge each cell individually.

I have enclosed a drawing (Figure 3) of the

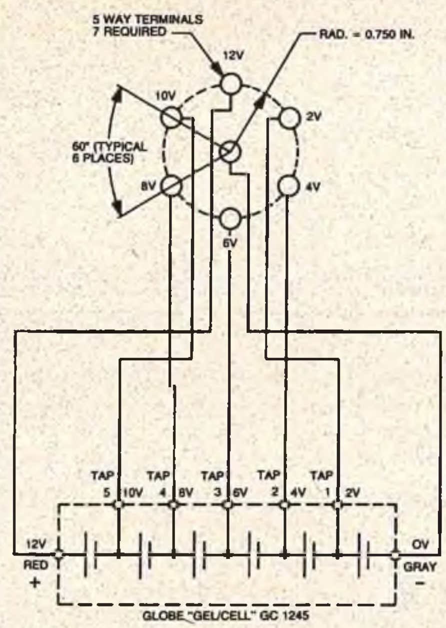

FIGURE 3

connector field I use on my battery box. It utilizes seven 5-way binding posts arranged so that each is 3/4" from the adjacent posts and 3/4" from the center. By then using a standard banana plug on the end of my glow plug wire, I can access any cell I wish or get 2, 4, 6, 8, 10 or 12 volts by using the center post as common.

Of course, if tapping the battery is totally out of

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RADIO SPECTRUM

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the question, then a simple constant current supply is the next best glow plug source (I have enclosed a drawing (Figure 4) of one I use): The advantage here is it utilizes the entire battery and the length and size, to a degree, of the glow plug cable and have little effect on the current.

I feel that anyone who seriously wants to use Gel/Cell batteries should write to Globe for their design literature. It is very straight forward and contains a sizable amount of data covering all the battery and cell types.

I hope all of this can be of assistance to someone.

Sincerely yours,
Arthur G. Kriss
Oakland, New Jersey

Thank you for the fine letter. I'm sure it will be appreciated by many. We've had many inquiries about glow plug circuits and you've shown two good ways to get there. While the variable duty

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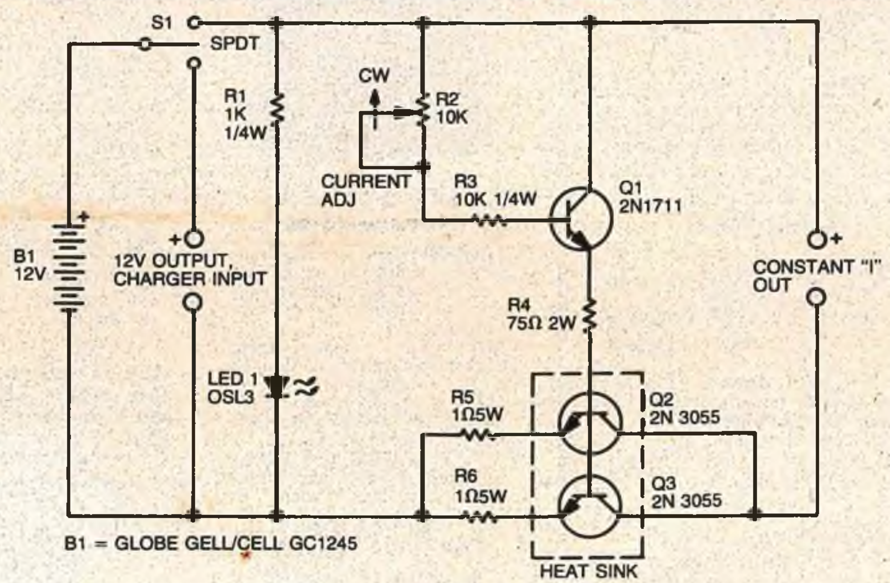

FIGURE 4

AMA FIELD CART

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sit level in the cart, an additional strip of 3/4" white pine is installed under the left side of the cans with the outer edge of the can flush with the outer edge of the pine strip. The strip is also flush against the ends of the 3/4" doublers. The front edge of the fuel can should not extend beyond the front edge of the cart. If it does, the front panel will not fit on the cart. The cans are held in place by 1" wide metal strapping. The strapping can be made from any suitable lightweight metal such as the material used in tin cans. The straps should be long enough to reach over the top and down the sides of the cans. The lower end of the strap is fastened to the leveling strip of pine with the upper end fastened to a 3/4" piece of white pine which is installed firmly against the top of the fuel cans and screwed to the side of the cart.

It's nice to have 2 gallons of fuel available, but there has to be a method to get this high-priced juice from the cart to the plane. Well, these gas-hungry machines that we fly require frequent re-fueling, and the old squeeze bulb method is no longer adequate. We have acquired, through the good graces of Sonic Tronics and AHM, several electric fuel pumps. As can be seen in the photographs, the pumps are mounted above the fuel tanks and towards the rear of the cart. They are fastened using the same metal strapping that was used to secure the gallon cans of fuel. To make it easier to turn the pumps off and on, the switches in the pumps were disconnected and replaced by double pole-double throw-center off-toggle switches. These toggle switches are mounted under the shelf and recessed enough that they don't protrude past the front edge of the cart. These pumps are not designed for 12 volt operation. Therefore, a dropping resistor must be provided. These resistors are distributed by Sonic Tronics and available at your favorite hobby store. They do get quite hot; therefore, they should be mounted on a suitable heat sink. I used some scrap pieces of 1/8" aluminum and mounted it under the shelf (see photo). The wire used to connect the switches and the resistors can be 20-22 gauge.

The caps on the gallon cans will have to be drilled and 2 pieces of brass tubing soldered in place. The brass tubing should be about 2" in length and of the proper diameter to provide a snug fit for the fuel tubing. It will be noted from the photographs that there are 2 tubes coming from the gallon cans. One is a vent, the other is the fill line. The fill line is extended to the bottom of the can using surgical fuel line. The vents must be brought to the front of the cart as shown in the photograph so that the fuel will not siphon from the cans when the cart is laid down. When the tubing is routed to the front of the cart, make sure that there are no kinks in it. Use the outer tube from a section of NyRod to extend the fill line and the vent to the front of the cart. I used plastic cable clamps to secure the tubing to the cart. The fill lines are 3' long with a 1¼" piece of brass tubing inserted in the end (Sonic Tronics). To refill the fuel cans, use the pumps. It is a lot easier than refilling them by hand or replacing them with fuel cans. Don't run the pumps longer than a few minutes at a time or the motors will over-heat and melt the brush holders.

This cart is also equipped with two glow plug leads. Of course, the same problem exists that we had with the fuel pumps, in that 1½ volts are required for proper glow plug operation and the battery supplies 12 volts. Therefore, a dropping

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AMA FIELD CART

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resistor is needed. This has to be one hefty resistor because of the amount of current drawn by the glow plugs. The resistors are 2 ohms, and a minimum of 40 watts. They are mounted on a sheet of 1/8" aluminum to provide adequate cooling and are fastened to the underside of the shelf. The glow plug leads are regular stranded lamp cord and must be 120" long. (Length of wires specified because they are part of the voltage dropping circuit.)

Being basically a lazy bunch of guys, we felt that starting the engines, using the old hand method, was not adequate. Besides, sticking your fingers into a propeller doesn't look like something a professional R/C pilot would do. So, through the good graces of Matty Sullivan of Pylon Products and our friends at Sonic Tronics, we were supplied with electric starters. The electric starters are designed for 12 volt operation, therefore they do not require dropping resistors. If the Sonic Tronic starters are used, the wire length should be increased by 57" to give adequate area in front of the cart to service two aircraft.

The starter holders shown in the photos (left front of shelf) are made from 3/8" plywood. The center strip that separates the two starters is 3/4" pine. There is a metal bracket over the starters which holds them in place when the cart is laid down for transportation. This bracket is made from 5/8" x 1/16" strip aluminum and is formed over the top of the starters. It is held in place by a 3/16" x 2" wing bolt threaded into the 3/4" pine strip. The Sullivan starters (compliments of Matty Sullivan) require a box 8½" x 8¾" x 3¼", while the Sonic Tronics (thanks again, Sonic Tronics) box is 7" x 9" x 3". The boxes are recessed 1" from front of cart and bolted to the shelf.

Figure 3 is a wiring diagram for all of the electrical hocus pocus used. It should be noted that there is a 35 amp. circuit breaker in the positive battery lead. (See Figure 1 for location.) This serves not only as a safety device, but as an off-on switch when the cart is not in use. Mounting will vary with the type of breaker used. (I used a surplus aircraft type.) No matter what type is used, it should be recessed about 1" from the front of the cart to avoid damage. The battery lead (#12 wire) coming out of the circuit breaker should go to a terminal strip with at least 12

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AMA FIELD CART

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terminations (6 pairs). This strip is obtainable from an electronic parts store. The terminal strip, which is fastened to the shelf behind the charger, is used to connect the power to the fuel pumps, the glow plug leads, and the starting motors. Be sure to provide a non-metallic covering to prevent short circuits. I used a plastic butter dish cover held in place by metal strapping.

Now again, place the battery and mounting assembly in the cart and move the battery over as far to the left as it can go and fasten a 1/4" ID collar against the outer edge of the right-hand hanger. Place the battery cables on their respective terminals (longest cable on right terminal) and then lay the cart back to insure that there is enough slack in the cables to allow the battery to swing freely. Fasten the battery cables to the left side of the cart, approximately 3" under the shelf, using plastic cable clamps as strain reliefs. After they are fastened, place the cart in an upright position. Now, on the free end of the cables that come up through the shelf, place a 1/4" x 3/4" bolt through the eyes of the cable and fasten with a nut. The cable should extend about 2" above the shelf and should be fastened to the side of the cart using cable clamps. Do this to each cable. This will be the main junction point for the power supply. The positive battery cable is wired to the circuit breaker (use #12 solid wire) as well as the positive lead from the battery charger. Fasten the negative lead from the battery charger to the negative battery cable. Run a #12 solid from the negative battery cable to the terminal strip. Run the charger and terminal strip wire around the back of the shelf and clamp securely to the back of the cart. Once these connections are made, the bolt should be wrapped in tape and secured to the side of the cart using plastic cable clamps. This battery can furnish a lot of current, so unless you are in the mood for fireworks, be sure that the bolts are properly separated and insulated. If they touch, they can cause one heck of a spark and possibly a fire. For appearance, use a plastic cover similar to the one used on the terminal strip.

The battery charger used provides 4 amps of charging current. The charging leads are run around the back of the cart the same as above. Remove the clips as well as excess wire and fasten the battery cables as mentioned above. The AC cord was also too long and, rather than storing the excessive slack, I opened the charger and cut off all but 14" of the cord. You can see in the photographs that there is a toggle switch added to the lower right hand corner of the charger. This switch turns off the charging leads to the battery so that, when the cart is not in use, there will not be any discharging of the battery through the charger. True, this discharge current will be minimal, but I felt that the installation of the switch was worth the effort, and also makes the cart look more complicated! The charger is fastened to the right front of the shelf (recessed 1") using self-tapping screws run through the shelf into the base of the charger. Tighten until the rubber feet start to compress. The outlet box above the charger has a 15' extension cord wired into it. This is in case the cart cannot be physically located close to an AC outlet. The outlet also serves as an AC source for a soldering iron or any power tool needed for repair of aircraft and equipment.

The two drawers are made by Rubbermaid. They come equipped with the hangers and necessary hardware.They do not have the separators as shown in the photograph. The separators were made from scrap pieces of plexiglass storm window, obtained at no charge, from a local hardware store, cut down to size using a sabre saw, and fastened to the inside of the drawers using Weldit cement.

The cart handles are made from 1/2" ID rigid conduit. Cut 2 pieces, 45" long, and file the ends so that there are no burrs to scratch your dainty little hands. The bend in the handles can be made in one of two ways: The first way is to grasp the end of the pipe with both hands, walk up to a sturdy tree (preferably your neighbor's) and whack the other end of the pipe against the tree as hard as you can. This may cause a slight bend in the pipe. If the bend is not enough, keep beating the tree until it develops the proper radius. (The pipe, not the tree!) If you are more technically oriented, acquire, by either stealing or borrowing, a 1/2" rigid conduit bender and use that.

I strongly suggest the latter method. It makes a more professional job and tends to keep harmony between you and your neighbor! Drill the mounting holes in the conduit using the locations as shown in Figure 2. Fasten the handles to the cart using 2" x 3/16" bolts, which are threaded into T-nuts installed on the inside of the cart on the vertical 3/4" corner reinforcing strips. Note that the bottom of the handle is flush with the bottom of the cart. Note also that the center line of the handle is 3/4" in from the edge of the cart. This will place the mounting holes in the center of the vertical 3/4" corner reinforcing strip.

To add that special look of professionalism to the Show Team's appearance, I provided six transmitter mounting brackets on the rear of the cart. If this cart is to be used as a club project, you might not feel that they are necessary. But just in case you'd like to spend some more time away from your family, they can be made using 1/8" music wire. (See Figure 2.) All bends are made by heating the wire with a torch until it is red hot, then bending. The mounting loops in the ends of the wire are made in the same fashion. The brackets are fastened to the cart using 1/2" x #8 pan head screws. All joints in the music wire are made using silver solder; regular solder is not strong enough. Notice that the mounting brackets are angled, with the top out. This is so that the antennae will overlap the transmitter mounted above it. This angle is obtained using 3/8" plywood supports as shown in the photograph. See Figure 2A for dimensions.

There is one more little plumbing job to do, and that is the front support of the cart. This was made from two 3" flanges and a 4¼" threaded nipple. The flange is fastened to the underside of the cart, located as shown in Figure 1 using 1/4" x 1¾" flathead bolts.

The front panel is secured to cart, using nine #6 x 3/4" FH wood screw. Three on each side and three on bottom, all evenly spaced around sides.) See Figure 1 for dimensions. Drill mounting screw holes 3/16" in from the edge of the panel and counter sink. Hold the panel in place on the cart and mark the hole with a pencil. Drill small pilot holes in the sides and the bottom of the cart.

To provide a suitable, durable paint finish for this mobile coffin, I used two coats of Ditzler Acrylic Enamel Primer and two coats of Ditzler #DAR8259 Acrylic, Enamel White. Wet sand the prime coat using 400 grit wet-dry paper, and allow to dry thoroughly before applying the finish white coat. (See instructions on can for more detailed information.) I found the painting a lot easier when all equipment was removed — less masking is required. Once the painting job is completed, you can load all of the equipment back into the cart and head to the field. This hernia stretcher weighs 130 pounds fully loaded, so you will probably require help loading it into

your car. The handles and the front stand are designed to double as lifting points and will carry the full weight of the cart.

Well, that's about it. Building this thing has been both a pleasure and an extreme pain in the butt. No doubt, you will have your own modifications that you'll want to apply — go ahead, just don't bother me with them! You could use a transistorized voltage regulating system for the pumps and glow plug leads, different paint, different cart dimensions, etc., but the Show Team has been using them for about a year now.(Oh yes, I had to build two of these things!), and they have proven to be more than adequate.

Good luck and happy hernia.

MATERIAL LIST

1 4' x 8' x 3/8' exterior grade plywood
1 1" x 8" x 8' white pine
2 drawers, Rubber Maid, 15" x 12¼" x 4"
2 wheels, Sears 12" x 3" solid, for 1/2" axle
1 charger, Sears 4 amp/12 volt
1 1/4" x 36" steel rod
1 1/2" x 36" threaded steel rod with 4 washers and 4 nuts
1 AC outlet box (externally mounted) with double receptical and face plate
15' extension cord — 14 gauge
1 35 - 40 amp circuit breaker
2 DPDT center-off toggle switches
1 SPDT toggle switch
2 2" flanges
2 3" flanges
2 1" x 3/8" threaded nipples
1 4¼" threaded nipple
1 10" x 8" x 6¾" 12 volt battery (type 24 case)
1 battery hold-down frame
2 10" battery hold-down bolts with nuts and washers
1 quart Ditzler acrylic enamel primer
1 quart Ditzler #DAR8259 acrylic enamel white
1 quart Ditzler #DTR602 acrylic enamel reducer
1 pint Ditzler Delthane additive — DXR80
2 battery cables — 20", 14"
2 20 Watt 4 ohm resistors (fuel pumps)
2 40 watt 2 ohm resistors (glow plug leads)
20' lamp cord (16-18 gauge)
4 alligator clips
110" 1/8" music wire
8' 1/2 ID rigid conduit
MISCELLANEOUS: 1 box 6" x 3/4" FH wood screws, 1/8" aluminum for battery holders and heat sinks, (see text), metal strapping from tin can, 10' of #12 wire, one 1/4" ID collar, assorted plastic cable clamps (Radio Shack), 1 box #8 x 1/2" PH screws, 13" of 3/4" x 3/4" angle iron.

COLIBRI MB-2

from page 71/65

.... tured by Graupner, is used for the wing. As already used on the Turbulent D-31, the reinforcement strips are used on the wing and fuselage and the sewing is imitated by little "glue-worms." This finishing work takes a lot of time, but provides the final touch a scale model gets through these details. The details of the reinforcement strips and the sewing stitches are described in the article about the Turbulent (RCM August '75).

I was very lucky in regards to the paint. The designer of the original plane gave me the rest of his enamel, this model is painted with the original paint!

The first flights were carefully prepared. Special care has to be given to scale models, due to

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COLIBRI MB-2

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the excessive amount of labor involved and due to the fact that the whole system (model and controls), is more complex than on a standard R/C model. The engine run was checked in all positions and throttle settings. The taxi characteristics were carefully examined and a detailed check of the model, with regards to loose bolts, inadequate tension in the control cables, etc., was made.

Finally, the long expected moment of the first flight came. The model had a tendency to climb and had to be heavily trimmed down. The difference of angles of attack was reduced on the spot (it is easy due to the "mechanical trim"). The next flight was much better, however about 70 grams of lead was mounted to the engine mount before the third take-off. The flight characteristics were perfect now. Simple stunt maneuvers were performed, as well as low passes over the field. At safe altitude the low speed characteristics were tested. The model has to be forced into spinning and recovers by simply centering the controls and applying full throttle gently. The landings are very realistic and present no problems.

The Original Aircraft

There is not much to say about the original. Like many nice things in this world, the Colibri simply appeared one day. The first flight was made after about 3 years of design and construction. There was no publicity at all. The nomenclature says that this is the second plane by the designer. While the MB-1 was somewhat "square", with a wing utilizing a center flat portion and "ears", the MB-2 presented a true step forward. The styling is very elegant for a "home-built", and a lot of attention was given to the design on the airfields and "experimental" meetings. The MB-2 is, today, a very popular plane. Five Colibris have actually been built in Switzerland or are already finished. The plans are available from the designer: Mr. Max Brugger, 1751 Villarsel le Gibloux, Switzerland.

Building Instructions

General:

The Colibri MB-2 can be considered to be an all around model, be it a super-scale, semi-scale or even a trainer for large models, depending on the skill and the demands of the builder and pilot. The model was built and designed according to the original plans. The flight characteristics are superb and uncritical. During construction you always have to consider the weight problem and to build the model as light as possible, especially behind the C.G. Study the plans carefully before starting construction and plan every work sequence before beginning. It proved to be economical to buy large plywood sheets 0.6 and 0.8mm thick (0.025 and 0.03 inches). The bolts not especially mentioned are cylinder head bolts M2 (3/32").

Fuselage:

Cut the .8mm plywood sides (be careful about grain direction) and apply the 5 x 12mm balsa longeron according to detail "X". Glue the .6mm ply doublers and finish the sides. Cut the formers and glue the sides to formers 1 to 3. (The edge of the ply is used as baseline, see detail "W"). Glue the formers 3A to 8, as well as the lower transverse members. Check the correct angle on formers 3A and 4. Inspect the symmetry and glue the fuselage floor front and rear and apply the sheeting on the fuselage top. The .6mm ply for the seat support is installed and the whole

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front section of the fuselage is treated with clear dope and the interior is painted white.

Before gluing former 2A and applying the front top sheeting, we have to install the rudder and brake pedals, as well as the carpet. I used a self adhesive foil as a carpet. Finish the canopy after that and finish the fuselage smoothly. Cut the openings for the windows and part 14 between formers 3A and 4. The fuselage is now treated with clear dope and then covered from bottom to top with a thin nylon fabric. The edge of the fabric is covered with a finishing strip, also the fuselage edges are reinforced with these strips.

Wing:

Build a jig for the ribs first. Use a plywood plate 6 or 8mm x 100 x 500mm (1/4 or 5/32 x 4 x 20 inches). The rib outside contour is cut out from 3mm (1/8") plywood, but without leading and trailing edge. Cut the rib drawing from the plan and glue it to the base plate, cover it with a thin polyethylene sheet and fix the 1/8" sheet with some nails on the jig. Cut some ply pieces to position the rib elements and nail them to the jig as well. In order to allow easy removal of the ribs, some holes are drilled into the baseplate, through which the ribs can carefully be pushed out of the jig with steel pins.

The spruce spars are cut to length and put into the jig. If necessary, they can be softened in hot water and pre-bent. Glue the front 4mm ply, after that the diagonal stiffeners, as well as the .6mm ply doubler are installed. The first and the last rib have to be symmetrical!

Build the spars now. On the main spar a 5 x 20mm balsa piece is glued at location of every rib. Before the assembly of the wing, all the holes for the landing gear, control cable pulleys and the control stick have to be drilled into the spar. The wing has a little wash-in, i.e. the angle of attack is reduced at the wing tip. This is achieved by putting the strips, during assembly procedure, as indicated on the plan. Before sheeting, wing parts 17 and 26 have to be bolted, and then the pulleys are installed. Apply the sheeting on the bottom of the wing first, check the wing for correct geometry, and apply the top sheeting. The circle segments are cut after sanding the wing, using a template. As section D-D shows, a balsa strip is glued on every rib and sanded down to the thickness of the plywood.

Section C-C shows the installation of the ailerons, as well as the rudder and elevator. These sub-assemblies are constructed conventionally from very light balsa. The wing, rudder and elevator are covered with fabric (I used Graupner No. 615), while the sheeted horizontal tail has a thin paper cover. Don't forget to install the control cables before covering the wing.

Landing Gear

Some mechanical skill is required to construct landing gear. After finishing all the detail parts, the steel tube 27 and axle 30 are brazed, then part 28 is brazed to the axle. Part 31 is slid into the rectangular tube 27, hole is drilled, and then the thread has to be cut into part 31. Part 31 is then inserted into steel tube 27 and the tube is then bolted to part 32 with an M3 bolt, as shown on the drawing. Check alignment of the wheel axle! Secure the M3 bolt, grind it smooth, and check for easy movement of part 32 in the rectangular tube. Slide parts 33 and 34 into the rectangular tube and drill the holes. Bond the balsa lining to tube 25, sand it into the form, and reinforce it by a fabric cover.

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Now the spring strut can be assembled. Insert part 32 with some grease into the rectangular tube and bolt part 31. Insert the compression spring and bolt parts 33 and 34 to tube 25. The wheel cowls, which are custom made, are made to fit and are installed together with the dummy brake 29. A T-shaped brass tube is used as the guide for the brake cable. The end of the cable is bonded into the balsa sheeting. Lateral play of the wheels is compensated for by washers.

Also, for the tailwheel, we start to build all the detail parts first. Parts 41 and 42 are epoxied and cured hot, if possible. Re-drill part 41 after curing and bond the stiffeners. Bolt and epoxy parts 40, 43, and 44. The blade spring is made now and the tailwheel assembly completed. As with the main landing gear, also the tailwheel is mounted permanently only after completion of the model. The tailwheel is connected by little springs and drilled .5mm wire to the rudder.

Our model is now ready to be finished. After covering all the surfaces, all the free ribs, spars, etc., (i.e., all the edges, that are not sheeted) are covered with reinforcing strips. These strips are made by using a sawing blade with teeth about 2mm high and cut from blue-print type paper. After one coat of clear dope over the strips, the attaching stitches are simulated by applying little "worms" from white glue with a hypodermic syringe. After this, the plane is finished with clear dope.

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Before installing the remaining details, the plane has to be painted. Note that only the bottom of the wing has the registration letters. After the application of the paint, I used a semi-gloss clear dope. The engine cowl and canopy are made to fit before the final coat, of course.

Now we start with the controls. Make the control stick and all the elements that belong to it. Tube 40 is epoxied to part 42. Part 41 is bolted to the spar, the stick guide 41 and 42 is slipped on, and part 43 is bolted and epoxied. Bolt aluminum tube 44 at this time. Note: The stick has to be removed for the assembly and disassembly of the wing to the fuselage every time - - - it is, therefore, just plugged into tube 44!

The servos are now installed, the elevator and rudder fitted to the fuselage and the aileron and throttle into the wing. The elevator is operated by a pushrod, while the aileron and rudder are driven by cables. For the adjustments, there are Kwik-Links soldered to the cables on the servo side. On the rudder horn side the cables are fixed according to detail "Y" with a brass fitting and M2 bolts. The cable ends are finished according to detail "X". Two 1.5mm diameter piano wires are used to connect the control stick to the servo. An electrical terminal is used for the adjustment and the disconnection for the disassembly of the model. The battery is attached to former 1. A switch can be installed on former 3 beside the seat cushion.

For the cushions we need 15mm foam rubber (3/4"). The cover is imitated by self adhesive foils. First the stitches are made on the red foil, then the protective sheet is removed and the foil glued to the foam rubber. Then the black foil is made to fit and glued carefully to the foam rubber. The back cushion is bonded to the former 3 with some contact glue, while the cushion is also used to cover the control equipment in the wing. The seat cushion is fixed as follows: On the back side, the seat cushion is slid under the back cushion. On the front side, tapered foam rubber is glued to the cushion. This rubber is then clamped under the seat support. The side linings are made with the same self adhesive foil as the cushions. Make the sewing stitches on the red foil and bond it to the sides. The black foils are made to fit, then the map-pockets are sewn on (do not remove the protective paper here!). The shoulder belt is attached with an aluminum bracket to the intermediate floor near former 3A. The seat belt is glued under the seat cushion on the rear side.

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At former 2A a 10mm wide, 0.8mm ply is installed. The frame for the instrument panel is made from 3mm ply. Cut the openings for the instruments into the cover panel and glue it to the frame.

The anti-glare surface is black wet-or-dry sandpaper (180 grit) bonded to the panel, then the instrument rings are installed. On the back side, the plexiglass is glued in, then the photos of the instruments are fixed with tape. The artificial horizon is colored orange with a felt pen. Part 9 is covered with black self adhesive foil. The control knobs (I use leather rivets) are attached with thin aluminum tubes. The throttle knob is made from wood or white plastic, bonded to a 3mm aluminum tube and installed free moving. In order to make it operative, connect it via a bent piano wire to the throttle linkage. The inside signs are bonded with double sided tape.

We now can manufacture the canopy frame. After gluing parts 10, 10A and 10B into the form (10B is made to fit the fuselage outline at the cockpit), they are connected according to detail "V". In order to give the correct cant to parts 10 and 10A, they are glued together on the fuselage. Make the canopy fit and cut out the ventilation window. The cut-out piece is then sanded smooth and glued to a piece of 0.5mm plexiglass (use a translucent glue!). The guide rails are also made from plexiglass and bolted to the canopy with very small bolts (M1). The ventilation window is then slid in and fixed in a semi-open position. The hinges are made to fit on the fuselage and the frame. Then a large radius is made on the inside of the frame, and painted white. Since it is critical to glue the canopy, it is screwed on the frame with very small wood screws with countersunk heads, then a cover of white tape is applied over it. Install the locking system now. The canopy can be opened by releasing the latch through the ventilation window. The latch is self-latching when closing the canopy.

An HB .61 engine is used with a 400ccm (24.5 cubic inches) tank. The tank can be installed comfortably between formers 1 and 2A. Due to the special muffler type "Sport-Q-MB 2" by Messrs. Fung, 586 Iserlohn, Germany, the exhausts are conducted like on the original. Two (2) Williams Bros. "Whirlwind 2" cylinders are required for the dummy engine, we just need about 30mm of the bottom part. The remaining parts have to be built-up. Part 52 is made in a block and planned conical according to the drawing. Bond parts 50 to 53, then bolt them with 60mm long M3 bolts with the Williams cylinders to the baseplate 54. The valve cover is available custom made. Make a 3mm plywood part, and fit and bond it to the cover, then the 5mm ply is epoxied and the whole unit is mounted to the cylinder block. The Williams Bros. valve pushrods are elongated with aluminum tubes, bolted to baseplate 54, and slipped through a hole in the 5mm ply. The cylinder block is painted metallic (Humbrol 53), use silver (Humbrol 11) for the valve cover.

Make the mounting brackets for the engine cowl first, making sure the thread is very tight. Bolt the brackets to former 1, and make the cowl fit now by using the spinner as a center. In order to avoid a big hole in the cowl, I used a plug to connect the glow plug to the battery.

First Flights

The C.G. has to be correct with an empty tank. Use some ballast in case the C.G. is not right. Use a 12"-5" wood propeller. It might be an advan-

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tage to remove the wheel cowls for the test flights. Due to the wide wheelbase, the model is very stable when taxiing.

The MB-2 lifts its tailwheel from the ground after a very short run, however, do not take-off too early. If trimmed correctly, the MB-2 is very stable and responsive to controls. Simple stunt figures can be flown after a short training period. Don't fly "pushed" maneuvers. Make your landing approach with some throttle on, removing it shortly before touch-down. The elevator should be fully up, so that the model does not nose over.

Final Remarks

I tried to provide a detailed plan, however, I could not put everything on it. I can provide the following material to the interested modeler:

3-view scale drawing 1:10, str. 5.—
20 color pictures of the original, str. 25.—
1 set of instruments (model size), str. 10.—
1 set cockpit inscriptions, str. 10.—

Please write to my address: Franz Meier, Widenweg 10, 8630 Ruti, Switzerland.

The following parts can be purchased from Helmut Stamm, Krautgartenstr. 11, 6336 Solms, Germany.:

Canopy, DM 18.—
Engine cowl (2 pieces), DM 28.—
Pair of wheel cowls, DM 28.—
Spinner, DM 8.—
Valve cover, DM 4.—

Good luck and good flying with your Colibri! □

TIN LIZZIE

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. . . . 6/32 x 3/4" bolts through the eyes of the spade bolts facing outward. Lock in place with nuts. Install the rotor tower base to the top vertical base angle. Use three 6/32 x 3/8" bolts. See photo #7 and #8.

(14) Now is the time to make all of the braces which are 5/16" O.D. 60-61-T6 .032 wall thickness aluminum tubing. Start with the diagonal side braces. Make sure the horizontal and vertical base plates are at a 90° angle and measure between the two bolts to which the diagonal brace will attach. Add 1/2" to this measurement and cut two lengths of the tubing to this length. Form 1/2" of each end flat by closing in a vise. Smooth the ends with a file. Again, measure the distance between the attaching bolts and drill a 1/8" hole in either end of the braces to match this measurement. Install, using an additional 6/32 nut. Make and install the remaining braces in the same manner (note — the nose braces should measure 14⅛" beteween attaching holes to give you the correct nose angle). In the photos you will note vertical braces centered between the vertical base and the rear vertical braces. This is not necessary unless you notice the tower base flexing during flight.

(15) Install the shortened main rotor shaft, the spacer, the swash plate, the anti-rotation device, the swash plate driver and the main rotor head as on the original model.

(16) Make the tail rotor drive cable housing. This is best done by buying a 36" length of 1/4" O.D. brass tubing. If this is not available (it was not in my case) you can make the housing out of 12" lengths of 1/4" O.D. brass tubing by soldering 1" lengths of 1/4" I.D. brass tubing over the 12" lengths as couplings. It is not necessary to heat the tubing to bend the radius needed to swoop up to the tail rotor coupling. Simply make a nice gradual bend by hand starting at the front tip of the vertical fin and ending lined up with the tail rotor gear box opening. After making, force some light oil (I use Singer Sewing Machine Oil) through the inside of the tubing and install on top of the tail boom using a 1/2" aluminum strap. This front strap mounts 6½" from the front of the tail boom with two #4 x 3/8" sheet metal screws. There should be a 3/4" gap from either end of the tubing to the tail rotor drive cable couplings. See photos #10 and #13.

(17) You are now ready to install the tail rotor

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drive cable. If you do not care to cut your original drive cable down in length, purchase a 40" length of speedometer cable. (.190 is about as close as you can come to the original diameter). This will cost about $3.50 at a speedometer repair shop. Cut to the proper length and install. Be sure to spread a liberal coat of light oil on the cable prior to installing.

(18) Install the tail rotor gear box and drive cable couplings using the original sheet metal screws and set screws. Install three 2/56 x 1/4" bolts to hold the top of the vertical fins together. Install one 2/56 x 1/4" bolt to hold the leading edge of the vertical fins together. This adds greatly to the rigidity of the assembly. See photo #12.

(19) Install the horizontal fin bracket and rear drive cable housing strap. This strap is installed under the front edge of the horizontal fin bracket. The back of the bracket is positioned 3/8" in front of the front tip of the vertical fin. Use four #4 x 3/8" sheet metal screws. See photo #10.

(20) Install the adjusting screw in the center rear of the horizontal fin. This is done by epoxying a 4/40 lock nut under the fin. After the epoxy sets, a 4/40 x 1/2" bolt is screwed to the lock nut and is used to adjust the angle of the fin for flying. Attach the horizontal fin to the bracket at the leading edge with two #2 x 3/16" sheet metal screws. See photo #10.

(21) A tail wheel or skid is the option of the builder. If you choose a skid, make sure you form the end which comes in contact with the runway curved up so the skid will not dig in should the machine go backward on landing or take-off. The skid should be made of 1/8" music wire.

All that is left is to install the main and tail rotors, tank radio, and control set up. One word of caution: Check the balance of **both** the **main** and **tail** rotor assemblies. Then take a break, have a cup of coffee or a brew, come back and check the balance again. It is **impossible** to fly a badly out-of-balance 'copter. To check for proper C.G. pick up the craft by the stabilizer bar (as close to the main rotor head as possible). All equipment should be installed and the fuel tank **empty**. The front and rear of the landing skids should come off of the runway at the same time. Most likely you will find the craft tail heavy. It took a 4 oz. lead disc to balance my bird. This is bolted to the extreme front underside of the nose plate.

While reviewing the photos, you will note several modifications that were made to the Schluter mechanics, mainly to the main and tail rotor assemblies and control hook-up. These modifications are not necessary or recommended if you decide to build the craft. They are just some ideas I wanted to try. The machine flies very well without any major changes in the original mechanics.

My machine is flown with a "72" Model Competition Series Proline Single Stick radio. No modification of the radio was necessary.

"Tin Lizzie" flies well in calm or fairly windy weather. You will find it to be an excellent flying machine. Try it, you'll like it. □

SAM

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. . . . C, Antique, and Texaco. 1975 SAM rules will be used and mufflers are required on all engines from .10 cubic inch displacement and up. Mufflers are to be unaltered and installed as the manufacturer intended. Contest Directors for the event are James W. Clark, 1127 Denmark Road, Plainfield, New Jersey 07062. (Phone: 201 756-1364) and Steven I. West, 13, No. Terrace, Maplewood, New Jersey 07040 (Phone: 201-763-1024).

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The Society for the Preservation of Old Timers presents its Second Annual Old Time Free Flight with Radio Control Contest on Sunday August 15, 1976, from 10 AM to 5 PM. The site is the North Branch Park, Somerset County, New Jersey. This is an AMA sanctioned event and the Contest Director is James W. Clark, 1127 Denmark Rd., Plainfield, New Jersey 07062. The events include classes A, B, and C, and Antique. The special fuel allotment of 1/8 oz. per pound will be a feature of the contest. All Old Timer classes and Antique are eligible and combined. 1975 SAM rules will be used and proof of an AMA and FCC license will be required. Mufflers are required on all glow engines .10 c.i.d. and larger. Entry fee is $5.00 for the first event plus $2.00 for each additional event. There will be fun, good food, and prizes at the SPOT Second Annual Old Time Contest. For further information, contact Howard Carman, 20 Maple Ave., Hightstown, New Jersey 08520.

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With many old model plans again becoming available (Megow-Cleveland and others) of scale, semi-scale, and free-flight designs, a whole new source of designs are now adaptable to RC. Many of these good drawings, with a bit of structural "beefing up" and "ruggedizing" for RC, are excellent flyers for beginner or advanced RC'er alike. The attached sketch shows areas that may need modification as suggested by Wayne Newberg of South Bend, Indiana.

For fuselages built with strip balsa longerons, use larger sizes or substitute hardwood. Landing gear mountings need to be strengthened with internal sheet doublers of light plywood; nose sections and firewalls should be reinforced.

Wings can use more sheet planking, hardwood spars and ply dihedral braces. Wire landing gears must be of heavier material to carry the added weight. See-through cabins with windows can be made stronger with a clear plastic bulkhead right behind the windshield.

You may see many other such easy modifications in your own specific design. Even some large rubber powered designs may be adapted. The use of current techniques of RC construction can make many of these old designs give you an ideal sport scale job.

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R/C Modeler Magazine's SAM column welcomes your letters, comments, and suggestions, address them to Randy Carman, c/o R/C Modeler Magazine, P.O. Box 487, Sierra Madre, California 91024. □

SUNDANCER

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possible. The two wing panels are built at the same time, one against the other, as a matter of fact. This self-aligning process, if used correctly, turns out beautiful wings very rapidly. So follow the procedure of the text and you should not have any problems.

Fuselage:

The pod and boom fuselage is made up from spruce, plywood and balsa. All the exotic contours are carved from block and are not too difficult. The control rods are internal and contribute to the aerodynamic cleanliness of the total sailplane. The fuselage components should be cut out before starting as the progressive assembly technique uses each succeeding piece as an alignment fixture. Start with the boom by gouging a groove in the inner surface of the 1/4" square spruce. Lay out the right plywood side, then glue on the 1/4" square spruce leaving just enough room for the control rod tubes. Glue on the left boom side and, while it is drying on the plans, make the vertical fin and rudder out of 1/4" square balsa, 1/16" ribs, and trailing edge material. While this is drying, the 1" x 1" x 6" balsa blocks should be hollowed out so the control rods will fit inside where they exit the boom. Then glue these blocks to the front end of the boom. To help keep the alignment true, glue the center section former B to the front end of the boom and blocks making sure the stringer notches are clear of the balsa block.

The radio tray is made from 1/4" sheet with plywood laminated to areas of stress and at mounting points. The radio components are mounted from the bottom so the radio and tray can be slipped in and out with ease and the rats nest of wires can be lost in the bilges. This method of mounting is excellent as the electronics can be moved from one model to another quickly and cleanly. This tray now becomes the alignment fixture for the front fuselage.

The stringers are cut 15¼" long and joined at the rear with some cloth in order to make a hinge. With the stringers together mark off both sides 7" from the hinge end. Place the hinged stringers in the notches on former B with the pencil marks on the former, and the hinge line centered on the boom. Trial fit the assembly a few times and, when it seems right, glue it securely. After the glue is dry, bend the front of the stringers around the radio tray and glue the stringers for former A, glue carefully so that the radio tray is still removable. The 1/8" pod sides cover the lower side of the fuselage from the top of the spar to the bottom. Glue on the pod sides putting the 1/4" square mini former at the bottom edge between the battery and receiver areas.

The 1/4" sheet bottom is put on in the cross grain manner to do two things for you: (1) make for an easy no-bend assembly, and (2) increase the ruggedness of the bottom. For a more bullet proof bottom, laminate a strip of thin plywood on and, when finished, add a hardwood skid. Glue on the nose and wing fillet blocks and temporarily tack on the canopy block. Take the plywood wing root rib, outline the center section block for the correct incidence angle and wing rod holes.

Now grab your wood rasp, gouges, motor tool,

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knife, sandpaper or what have you, and create those compound curves to your hearts content. The more sleek the curve, the less parasitic drag and the better the performance of the finished plane. After the fuselage is shaped, take off the canopy block and hollow it out to fit your electronics — the line on the plans is a suggested limit. The fuselage is now ready for the control installations, final assembly and finishing.

Wings:

The wing is a conventional "D" tube construction with the spars on the surface in deference to the thin airfoil, while fuselage to wing mating is accomplished with a tube and rod.

Make up one tip and two root ribs out of 3/32" plywood to be used as templates for cutting out the rest of the ribs. Save the plywood ribs and use them in the root rib position. Make 26 constant chord ribs for the center panels and 2 sets of twelve tapered section ribs. Notch the trailing edge for the ribs with a hack saw blade.

The plans are laid out in the manner they are for a reason, so you will get nice straight wings with no hassle. Try it! It works.

Make the two inner panels first by pinning down the trailing edge stock back to back. Take a 1/16" strip and shim the front edge of the trailing edge (T.E.) to the correct angle. Pin down the bottom spar and the leading edge and lay in the ribs making sure they are centered in the T.E. slot so you have room for the cap strips later. Don't try to put on the bottom sheeting now, as it will mess up the T.E. angle and will not stay up close to the front of the ribs. After all the ribs are in place, glue the top spar and the top sheeting on and don't touch a thing until the glue is set. Put the top cap strips on and let them set. Now you can take the pins out, put the front wing webs on and then sheet and cap strip the bottom. Don't sheet the top center section of the wings, the tubes aren't in yet.

Now lay out the outer panels on the plans exactly like the inner panels and before you do any gluing, block the inner panels in place with the polyhedral brace installed and aligning properly at an eight degree angle. Use the tapered shim for the T.E., so you will get the correct washout effect. Then finish the outer panels using the same technique used on the inner panels. You will be surprised how quickly you get two nice wing panels. Now install the wing tubes by butting the two panels together and epoxying in the tube in one piece. The trailing edge of the wing is so thin you can't put tubes of the correct size in, so put the rod right in the wing. Cut and bend the rod before installation and then use plenty of epoxy to fill the cavity from the T.E. to the rod. Put the rest of the shear webs and top sheeting on and then hack saw the wings apart. Presto, perfectly aligned wing panels.

Horizontal Stabilizer:

The stabilizer itself is a Warren Truss design with a spruce spar for strength and a unique hinging and mounting mechanism. To build, cut, pin, and glue right on the plans. The mounting and hinging mechanism serves two purposes — to increase the "crash worthiness" and to make for easy take-down and storage. The stabilizer simply slips on the front at the hinge platform in assembly and, if you have an encounter with an immovable object, it just falls out, hopefully saving servo gears in the process. During normal operation, the stab is held in securely by aerodynamic pressure so no rubber bands or other

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hold-down paraphenalia is required.

The hinging device is made from 1/32" ply and 1/8" spruce in a sandwich. The hinge is brass tube epoxied in place at the 1/3 chord point relative to the stab when it is in place. The horn can be internal, a la Cirrus, or external for ease of adjustment and/or repair. The external configuration is shown as it is practical for most modelers. Make sure the ply piece with the extra notches in it goes on the bottom of the sandwich for cleanliness and ease of assembly, and that the whole assembly is square when the stab is on. A couple of coats of glass and resin will increase the strength of this critical assembly.

Final Assembly:

Bend up the wing rods as shown on the plans. Make up the brass tubes for the fuselage noting the aft tubes don't go completely through. Trial fit the tubes, rods, and wings until the whole assembly is at the correct angle for incidence and dihedral, then epoxy the tubes in place.

Use your favorite hinge on the rudder. The method I use is the nested tube arrangement. It gives a smooth operating rudder with no binding or air leakage between the fin and rudder. The outer tube is the outer red tube from Sullivan control rods and the inner tube is brass, 1/8" I.D. I like plenty of rudder throw so the short rudder horn is hand made from 3/32" ply. I don't know of any commercially available horn that short.

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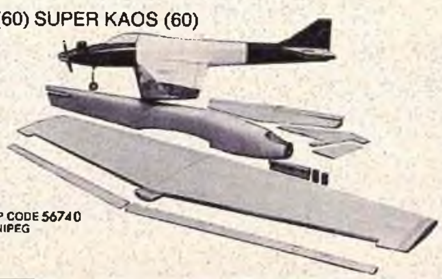

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The elevator horn has a 1" lever arm so it operates quickly also. The Goldberg short horn was used externally on the prototype.

Hinge the canopy block from the front with some MonoKote trim or tape on the inner mating surfaces. Now install control rods, bend up the rod endings and, finally, sheet the fin sides with 1/16" balsa. I saved the fin sheeting to last so that if you opted for the internal elevator horn, you could still do it.

Finishing:

Use your favorite film on the surfaces. Shrink the horizontal stabilizer carefully to avoid warping. Put on and half shrink the bottom first, then put the top on and half shrink. Now play both sides to full shrink gradually countering any twists with pressure and heat.

For the fuselage, you can't beat glass and resin for quick, tough and slick pre-finish. Use a couple of layers of light cloth, instead of medium or heavy cloth, as it goes around the curves better while giving adequate strength. The prototype is finished this way and does not show the wear and tear it has seen. When you complete the glass, resin and paint; the fuselage will look like it came out of a mold.

Weight And Balance:

The original model weighed 26 ounces as it came off the building board which included 7 ounces of radio. This model was not intentionally built light, there are just not many places to put the weight. The model balanced at 45% chord with no lead in the nose and using a small 225 ma battery pack. If you use a 500 ma battery you should get away from using any lead. In any case, start with the C.G. at 30%-35% of chord and go from there. The model will fly with the C.G. as far back as 50% and, while performance will increase, stability will decrease and it will be work to fly. Use the aft C.G. in contests when you want the most out of the model.

Flying:

Make no mistake about it — this model is a light air performer. At just 7 oz./sq. ft. wing loading, it floats on any semblance of lift. If you are used to "plastic wonders" you will have to learn some finesse in your flying, as the model sees every burble and bump. Retain the wings with tape. This may sound "Mickey Mouse" but it serves a dual function. First, the wing joint is tight and, second, the drag of the wing joint is reduced appreciably. To prove it, fly the model without the tapes and watch the performance go down and listen to the increased noise level. I use electrical tape and break the adhesive a little by running it through the fingers twice. This way you don't pull off any paint or wing covering on removal of the tape.

Hand glide the model in still air until you are properly trimmed. Make sure the washout is equal in each wing, not a lot — just equal. If one wing quits before the other, the model eats sky quickly. If you use a light Hi-Start or low wing voltage with gentle back pressure, you will get ample height without a lot of exciting skywriting. For heavy conditions ballast to about 35 ounces and watch it penetrate.

Conclusion:

I hope you enjoy the construction and flying of the **Sundancer.** It is not difficult to make a really high performance model with just a little patience and attention to detail. If anyone has a contest win with the model, I'd like to know about it, since that was the motivation for the design. □

SHARK .60

from page 41

The Shark fuselage is made of plastic and is very easy to assemble. The bodies obtained with both of our kits were of white plastic, since we had requested one that could be painted in a bicentennial color scheme. The fuselage that will be provided with the production kits will be of yellow plastic for maximum visibility. The plastic fuselages can be painted with Perfect Paints, light mist coats of Aero Gloss dope, or with Superpoxy paint.

The final set-up is covered very thoroughly in the instruction manual and should be no problem for even the rank novice. When the rotor head and blades are balanced as per the instructions, the helicopter is extremely smooth with no vibration of any kind.

Flying the Shark 60 is sheer pleasure! Both RCM prototypes used a Veco/Lee Custom 61 which proved to be more than enough power. In fact, the lift-off is very smooth at a little less than half throttle. This throttle setting was with the main rotor blades set at 4 degrees pitch at 1200 feet altitude. Any more pitch and the Shark will lift off sooner but will be more difficult to get down due to the extreme amount of lift generated. The "cans" make the Shark 60 a very responsive machine with the control rods set as close as possible to 3/8" from the output shaft. We use this means of measuring because every servo arm is not the same size. For example, if we said "the third hole out," then some of you would be upset because your servo arm only had two holes. So use whatever hole comes closest to 3/8" from the center of the output shaft.

When checking your controls while the rotor is turning, be careful not to hold the right and left cyclic too long. The "cans" give enough control, even at low rotor speed, to tip the Shark over. Low level, tight, Figure Eights are possible with this very responsive control set-up. However, hovering over one spot is also quite easy. In other words, the Shark 60 combines the best of two worlds — stability in the hover with high maneuverability.

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SHARK .60

from page 160/41

It is our opinion that the Du-Bro Shark 60 is destined to become the standard in helicopter trainers. The ease of construction and toughness of the machine should do for the helicopter beginner what the Falcon 56 has done for the novice fixed wing pilot. In addition, the three step training program incorporating the unique new training gear, designed by Dave Gray, virtually guarantees that the beginner will be able to learn the basics of helicopter control with virtually no damage to his machine during the initial phases of flight training if he follows the instructions to the letter.

This is not to imply that the Shark 60 is strictly a trainer. In fact, the new Shark is fully capable of all the current helicopter contest maneuvers that are now being used, and is capable of achieving all of the maneuvers in the NRCHA Grade Level Proficiency Program.

We could go on and on using all the superlatives at our command to describe this magnificant new machine from Du-Bro Products, but we're going to let the pictures tell the story. We were priviledged to have had the opportunity to build these two units and to make some suggestions that have been incorporated in the instruction manual. We cannot fault the Shark 60 in any

Du-Bro Shark .60 Helicopter Specifications

Overall Dimensions

Length — 58".
Width of machine at skids — 15".
Width of passenger compartment — 6".
Height — 22½".

Pre-Formed Parts

Many steel, brass and aluminum machined and pre-formed parts are ready to bolt together. Includes yellow A.B.S. plastic body, clear windows and black engine and gear shrouds.

Engine

Any .60 engine can be used in the Shark .60. The hotter, more powerful engines should be used in higher altitudes to make up for power loss. Mufflers are no problem.

Main Rotor

Shaped basswood.
Span — 57½".
Chord — 2⅛".
Airfoil, high lift section.
Hiller type semi-rigid rotor.

Tail Rotor

Shaped basswood.
Diameter — 12½".
Chord — 1-3/16".

Flybar

Steel rod — span 27⅝" with cans.
Cans — 030 aluminum, weight 30 grams each, and can be adjusted for variable control response from very docile to super sensitive.

Weight

Flying weight with full tank approximately 12 lbs. — additional payload depends on amount of reserve engine power.

Performance Data

Top speed depends on engine used, average top speed is estimated at 60 mph. Properly trimmed, will easily fly hands-off. Has been flown well in high winds. Altitude out of sight. Can perform any maneuver that a real helicopter can, including loops and rolls. Kit is complete, except for .60 engine, 12 oz. slant fuel tank and a good 4-channel radio.

way and feel that it is a thoroughly engineered, well designed, quick building and rugged machine that can serve as a first helicopter for the novice flier, as well as provide the serious competition pilot with a machine that is capable of advanced maneuvers currently used in helicopter competition. In addition, factory pre-production prototypes utilized virtually every type of .60 engine from old worn-out and over-the-hill mills to the latest crop of Schneurle power plants, and the machine flew with each and every one of them. Due to the set-up of the motor mounts, almost any .60 engine can be used except those equipped with a Perry Pump, or an extremely long engine such as the Profi 60, which exceeds the length of the motor mounts. As a matter of record, Dave Gray, designer of the Shark 60 and an NRCHA Director, set his Grade Level IV 30 minute duration flight with a Shark 60, equipped with an engine that had so many air hours on it that Dave had to fly the helicopter in forward flight for the entire 30 minutes, since the engine was too worn out to endure the rigors of a sustained hover!

Our congratulations to Dave Gray and Du-Bro Products for producing a truly fine and versatile helicopter that is destined to become, in our opinion, one of the most popular in the world, and one which will definitely set its mark in helicopter circles in the years to come. □

RADIO SPECTRUM

from page 116/38

cycle circuits that have been printed in other magazines are pretty neat, I have found that you really don't need that exotic a circuit to do the job. The main thing is to end up with a solid 1.5 volts at the plug. The circuit shown should do that, but if you're going to have it variable, you might want to put some meters on it. A voltmeter across the plug and an ammeter in series would make it complete.

It should be pointed out that this is not the most efficient method of exciting your glow plug. The power taken from the battery is 12 volts times the plug current, say 3 amps, or 36 watts, while the power into the plug is only 1.5 volts times 3 amps or 4.5 watts for an efficiency of:

$$\frac{4.5}{36} = 12.5\%$$

If you don't waste a lot of time starting, this is no problem, but if you've got a fancy rig, then the guy who is having trouble will want to borrow it and there goes your 12 volts battery.

We received a device (Photo 1) from SK Products which eliminates this problem by means of a DC to AC inverter, which should be about 75% efficient. It delivers a 3 volt peak-to-peak square wave to the plug which is equivalent to 1.5v DC. This should be all you need to make the plug glow, even if it is submerged in alcohol. The SK Products device also has a separate winding and rectifier to supply electrical power to your fuel pump. You get higher efficiency than any voltage dropping scheme and eliminate the problems of the battery tapping scheme.

• •

Many readers are interested in doing their own thing with regards to RC electronics, including their own servicing. If you decide you'd like to try this yourself, I suggest you buy an old used radio and practice on it while letting the manufacturer maintain the system you depend on. After you've convinced yourself, you can do the job (by flying

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RADIO SPECTRUM

from page 163/38

the old radio in an old plane), then you might consider doing your own service.

One piece of equipment you need is an oscilloscope and there is a wide range of capability and prices to choose from. Many letters ask what I recommend.

I started out with an Eico kit which I bought second hand many years ago. It did not have a triggered input or a calibrated time base. It did have D.C. response which I think is a must, and while this scope couldn't compare to the Tektronix scopes I used at work, I found it quite adequate. Eventually, I bought my own Tektronix and said to myself, "This is a good lesson. Always buy the first class product the first time around." However that decision is not obvious and everyone must make it for himself.

If I were to buy a scope right now, I would look for the following features:

(1) Adequate sensitivity — 10mv/division required, 1mv/division desired. (You will lose a factor of ten when you put a high impedance probe on the scope.)

(2) Triggered input — this allows you to look at a pulse position relative to some other pulse.

(3) DC coupled — this allows you to measure bias and gives you a true wave shape at low frequency.

(4) Calibrated time base — allows measurements of pulse widths, etc.

In a future issue we will tell you more about how to use the scope and even how to get around some of the problems if your scope doesn't have all those features. There are more and more com-

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RADIO SPECTRUM

from page 166/38

panies offering good scopes in the $500.00 to $1,000.00 range, which may seem like an awful lot. I remember the pains I went through trying to decide whether to buy the scope or a new radio. All I can say is the scope has paid for itself many times over.

• •

Well, we got the manuscript on the Christy Mixer, which I know will make a lot of you happy. I haven't had time to run a lot of tests because Don wanted to take pictures and publish the article as quickly as possible. But, I can say it does work as described. I must say that I had thought a lot about how to do the job and figured you had to go from digital to analog, which Christy does by integrating the incoming pulses, do your mixing, and then go back to digital. The problem is to make the circuit insensitive to voltage changes and with only four cells, you don't have a lot of voltage to work with. Mr. Christy has provided a simple zener diode voltage regulator which seems to be adequate. I operated the circuit on a three cell battery pack, which is a much larger change than you would normally expect and the neutral shift was negligible.

The circuit is fairly complicated, by necessity, but the components are spread out which should make the unit easy to construct. I predict someone will shrink the size down, because I can see a problem putting this unit in a glider or combat ship.

I totally enjoyed the article, particularly the circuit description and hope you do too. I think Mr. Christy has made a major contribution to RC and would like to encourage others to do the same. It may not make you rich, but I would think it would be very rewarding to be recognized as a contributor to the hobby by modelers around the world.

• •

A reader submitted a servo reverser circuit which was quite simple, but I am reluctant to print it because it is extremely voltage sensitive. It may be possible to stabilize it with a simple zener diode like Mr. Christy used, but if you can't wait, you can buy a servo reverser from Quantized Controls which does not have an appreciable drift with voltage. I have tested the QC units (Photo 2) and they look good. The one suggestion I had was to add a centering adjustment because it is impossible for the unit to have exactly the right neutral for all radio control systems. Bob Glorioso of Quantized Control said they considered a zero adjust, but after polling about 20 modelers who had used the reverser, said they were unanimous in saying centering is not a problem.

• •

For those of you who are considering building your own transmitter, you must start out with a first class gimble. If you've been reading this column very long, you know I've been harping on the importance of the gimble assembly. Bob Dunham, who is building all kinds of neat things for the RC industry, sent over one of his new improved precision machined all metal open sticks, which fills the bill. The "improvement" is the method of attaching to the pot without destroying the alignment which keeps the friction down. The old method simply used a set screw which will cause a mis-alignment if there is any clearance in the hole that accepts the pot shaft. The new set up uses a clamping action which eliminates the problem. The difference is shown in Figure 5.

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RADIO SPECTRUM

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The gimble is made from stiff extrusions and does not have the compliance problems found in some sheet metal open sticks.

The only problem might be to find a high quality pot that will fit in the relatively small inner gimble. The price is a little high, compared to plastic sticks, but I think it is worth it.

Bob is also working on a servo that is so small you won't believe it. Yes, the RC industry is thinking about you guys who want to fly little tiny airplanes.

Have a happy, and remember to keep your antenna up! *(Ed's note: What?!)* □

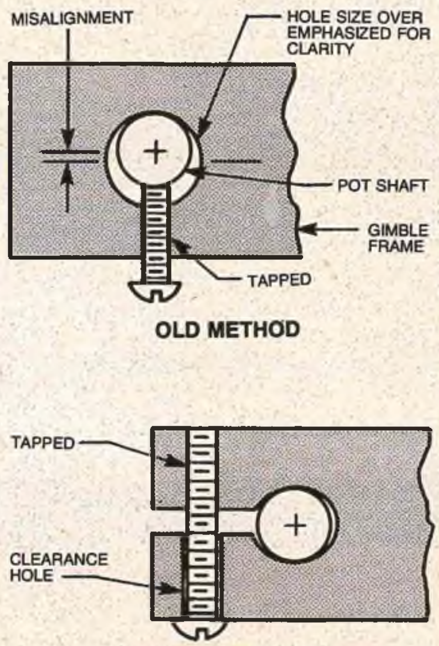

FIGURE 5

TOLEDO '76

from page 31

There were aircraft kits available to fill the desires of every modeler in varying degrees of simplicity or complexity. Biplane kits were numerous this year. Accessories, both decorative and functional, for all types of models were prominent. B & D Enterprises is producing Bob Violett's retractable steerable tail wheel mechanism that is operated by either pneumatic or mechanical retract systems.

An interesting aspect of the Toledo Show is the amount of effort and sophistication that goes into the design of a booth. EK, Kraft, MRC, Royal, World Engines and several others had very professional displays. Hobby Shack came up with a unique walk-in booth, packed with their broad line of merchandise that could be examined without being pushed around by the heavy aisle traffic.

Growing faster, and almost as big as the model aircraft industry, is the model boat business. If something floats, you can buy a model of it. The ingenuity and quality seen in the model boat products is first cabin. Sales of engines for model boats almost equals those for model aircraft. K & B has introduced a complete line of high performance marine engines.

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TOLEDO '76

from page 170/31

R/C race cars have matured into a substantial activity. An amazing number of track-proven kits and accessories were shown.

The ever popular Trading Post was even bigger this year. This is a section of the show where individuals may bring their personal items in the modeling field to sell or trade. It takes an awful lot of willpower to wander among the hundreds of tables and not buy a bunch of those neat things that fascinate you when you really don't need them. The swap shop auction was held on Saturday night. Thousands of dollars changed hands by bidders who were caught up in the auction spirit.

As usual, the Exposition was concluded with the awards presentation and raffle drawing. A fortune in sterling silver trophies was presented to the smiling category winners for the display models. With the drawings for numerous R/C systems donated by members of the model industry, the 1976 Toledo Radio Control Exposition came to a successful end. □

RACING AT RANDOM

from page 22/18

12 QM, Dallas, Texas, Dallas RC Club
13 Quickie 500, Dallas, Tex., Dallas RC Club
13 Formula 500, Cucamonga, Cal., Pomona MAC
13 QM NCPL Rules, Rochester, Minn., Rochester RC Club
20 QM, Sport Pylon, Hoffman Estates, Chicago, CPC Rules, Northwest RC Club
20 FI, Toledo, Ohio, Weak Signals
20 Formula 500, Chino, Cal., Amer. Model Aircraft Assn.
26-27 FI, Chula Vista, Cal. Aeronuts
27 QM, FI, Sig Field, Montezuma, Iowa, Sig
27 QM, FI, Lakeshore, Chicago, CPC

July

10-11 FI Sepulveda Basin, Cal., Valley Flyers
10 QM, Fort Wayne, Ind., CPC
11 FI, Fort Wayne, Ind., CPC
18 FI, QM, Sig Field, Montezuma, Iowa, Sig
18 Formula 500, Yorba Linda, Cal. RC Bees

August

1-8 Nationals, Dayton, Ohio, AMA
8 Formula 500, Whittier Narrows, Cal., Tailspinners
22 1/2A, QM, Rochester, Minn. NCPL Rules, Rochester RC Club
22 QM, FI, Chicagoland, Chicago, CPC
22 1/2A, Madison, Wisc. MARCS
29 QM, Weak Signals Field, Toledo, Ohio, Hobby Stop □

CLIPPED WING STEARMAN

from page 16

.... just outboard of the last rib W8, is the first step. For better stability, increase the top wing dihedral to match the scale dihedral in the lower wing. The lower wing aileron remains unchanged, but double ailerons give a better roll rate. The top wing aileron span is 13.4". Drill lightening holes in the ribs to reduce weight and you have it made.

Empennage:

Instead of using the kit materials, I used 1/4" square balsa stock to construct the elevator, rudder and fin. I did use the ribs to construct the horizontal stabilizer, but made it a flat bottom, or Clark "Y" airfoil section instead. This significantly reduced the weight in the tail which had seemed to be a problem on my previous Stearmans.

Fuselage:

This is where the work begins. Let's start at the tail and work forward. As constructed from the kit, the fuselage structure is weak, as can be shown by the ease with which the empennage can be twisted. Although the empennage will become strong when properly covered and doped, one has to hope there are no warps in the process. That could make the whole tail section crooked and ruin your whole day! To somewhat alleviate this problem, and consequently reduce tail weight, hog out every bit of excess wood you possibly can along the fuselage crutch and on all formers rearward with your Dremel Moto-Tool. Right! The structure is now even weaker and easier to twist! So, align it on your workbench with jigs, squares, etc. — make sure it is straight. Now cement 3/16" square balsa diagonals from the crutch to the main center line stringers to form a triangular construction. You now have a strong and light tail section.

Landing Gear:

The next item that needs some improvement is the landing gear. It's way too "springy." This makes for bouncy landings resulting in cracked gear fairings. I added an extra former 1½" in back of F2 which is used to fasten a rear landing gear wire. This wire is soldered to the main gear 1½" up from the axle. This allows one to make a more scale-like landing gear fairing which will withstand hard landings. With the additional wire, the bounce is attenuated. You will find that, as the wheels touch the runway, the airplane stays on and you can do a beautiful wheel landing. For an even more scale appearance, the gear scissors can be removed from a pair of Robart's scale gear struts and epoxied to landing gear. Car door chrome trim epoxied wire cabane and struts give a chrome-plated strut effect.

Front Cockpit:

The receiver, a rudder servo, and an elevator servo, can occupy the front cockpit hidden beneath a handy hatch installed between F3 and F4. Don't fly without a pilot, but one can be enough.

The Nose:

The area between F1 and F2, and the area above E4 is solid balsa block and is used as a hatch. The area below the hatch is completely hogged out with a Moto-Tool. Fill in the areas between the stringers with 1/2" balsa blocks carved and sanded to shape. Coat inside with resin and sawdust. This adds weight and strength to the nose. More weight can be moved forward by housing the battery pack, fuel tank and throttle servo in the open area between F1 and F2. This also makes for much easier access to those fundamental items.

Raid The Junk Box

Some fancy scale trim tidbits can be had from several junk household items which you have thoughtfully stowed away in the hopes that there will be an occasion to surely use them someplace on that next project, and which now threaten to over-run the whole shop! Windex has unknowingly provided a Stearman carburetor air scoop made from the handle of a clear plastic Windex bottle. Paint it and "Hot Stuff" it to the nose block. The wing gas cap is a friction knob from a fishing reel. Wood screw the wheel caps into the hub. Now they won't fall off, and they are much more scale-like in appearance. The engine is made from pine and bolted into the Tatone engine mount.

Wrap It Up

For power, add a Super Tigre .71 with a Du-Bro muffler. Cover with polyester and finish in Aero-Gloss. And there you have it, a clipped wing Stearman with double ailerons. This airplane flies much better than the stock Stearman kit. It's much tamer in all areas of flight. It flies so close to the light Aeromaster, it's unbelievable. I'm very satisfied with the outcome . . . you will be too.

Clipped Wing Stearman Modification Comparison Figures

I've been fooling around with these formulas for about two years. They seem to give one a pretty good idea about how an airplane will handle. I've found that the minimum tail volume formulas as applied to radio control (from E.A.A. formulas) give approximately .3 for the horizontal and .015 for the vertical.

Tail Volume Formulas From E.A.A.

Vertical Stab — between .04-.07. (Vert. Area; Tail Arm; Wing Area; Wing Span). Horizontal Stab — between .5-1.0. (Horiz. Area; Tail Arm; Wing Area; Wing Chord.

Try it guys! □

ON THE LINE

from page 12

spray on masking tape that takes the pain out of masking tape. Looks good.

Airtronics: Offers three new kits — the Aquila XL, a 150", 600+ square inch unlimited bird. The XL features a fiberglass fuselage and four piece wing. It is a complete kit with provision for up to 60 ounces of ballast. The Olympic II, a new standard ship which replaces the Olympic has 922 square inches, 40 ounces, 6½ ounce wing loading. Also shown was a cute little "old time" semi-scale ship called the Cadet. A new radio was on display, the Sanwa which offers servos that seem to be as small as you can get.

The winners in sailplane are as follows in order of place, plane, and state:

1st, Neil Liptak, Quasoar MK III, Illinois; 2nd, Jerry Mrlik, Astro Jeff, Jr., Michigan; 3rd, Ken Bates, Research VG, Michigan; 4th, Ken Bonnema (also 2nd best original design), Antiqurian, Ohio; 5th, Ed Purdy, Skipjack, Michigan.

The winners in Scale Sailplane are as follows:

1st, Gordon Pearson, Vector I, Michigan; 2nd, Kevin Pearson, Kestral 19, Michigan; 3rd, Barry Killick, Slingsby, Michigan; 4th, Francis Lasker, Primary Trainer, Michigan.

A flawlessly finished Hijacker slope sailplane built by Charles Kelly of Pittsford, New York, beat all the power ships to win the Best Finish Award!

★

Toledo and 27 MHz

On the first day of the show the AMA distributed a proposed rules change from the FCC which affects the use of the 27 MHz band for R/C purposes. Briefly the proposed change will eliminate R/C usage on the 27 MHz band and permit operation only on the 72-75 MHz band. The purpose of this change is to permit expansion of the CB voice channels.

A meeting of the R/C manufacturers and other model organizations was set up by AMA and chaired by Walt Good, Chairman of the AMA Frequency Committee. Several courses of action were discussed and the AMA is formulating a protest against the change. It is too early to provide complete details, but the following points were established by Walt:

(1) You will be permitted to legally use 27 MHz equipment for R/C purposes for at least 5 years after this proposed change becomes effective, sharing these frequencies with Class D voice stations.

(2) In view of the enormous popularity of CB radio usage (the FCC processed 400,000 licenses last month), the liklihood of losing the 27 MHz band appears high.

(3) The most favorable outcome for the R/C enthusiasts would be FCC allocation of additional frequencies in the 30-40 MHz band for exclusive R/C usage.

It is interesting to note that Germany has a total of more than 80 CB frequencies available for R/C use. We currently have 17 including the six 53 MHz frequencies which require a Technician License, with a code and theory test! Since the 72-75 MHz frequencies are shared with non-R/C users it is obvious that the continued growth of our sport is in jeopardy.

★

FAI FLIGHT TASKS

Pro:

Dear Lee,

My reason for writing is to comment on the attitudes toward the FAI Tasks to be flown in the upcoming team selection. There has been a little written and a lot said about the three tasks, methods of launching, and FAI rules in general. A large number of competitors are designing and building sailplanes with which they intend to win the World Championship in South Africa in 1977.

Then there are those who think that the emphasis that will be placed on the FAI will result in the death of RC soaring as we know it. To the members of this group; the 10 Minute Duration, 2 Minute Precision, or some form of precision-duration is the only way to fly.

The biggest stumbling block of the Speed and Distance Tasks is that they don't lend themselves to contests with a large number of entries. However, don't forget that the LSF Tournament has over 100 entries and flies the speed task with no problem.

Here's what I hope happens. I hope that the new crop of designs show that the heavier, more efficient ships with improved L/D will actually out-thermal the classic RC thermal sailplane. Last summer Jack Hiner from Chicago had his cronies (Dan Pruss, Keith Finkenbiner, Doc Hall) talking to themselves when he out-thermalled them with an old Nelson Ka-6. Just think, a 23 oz./ft.² wing loading ship out-thermalling a group of 6 to 10 oz./ft.² ships. Is there a message there?

Let's not condemn the FAI tasks just because we're not familiar with them. I think it will be fun and informative, too.

It may be that after this year's team selection that we'll all want to go back to our classic events with the long tow lines, but my bet is that we'll see some changes and improvements in airplane design. The team will probably be made up of the same people who do much of the winning of the classic events, but the airplanes will get better. When the airplanes get better, we enjoy the sport even more. And, lest we forget, that's what it's really all about. FUN!

Sincerely,
Warren Tiahrt
Troy, Michigan

Con:

Dear Lee,

In June 1952, at the end of a little berry field in northwest Arkansas, I lost a little Jasco Thermic C towline glider directly overhead after flying for over twenty minutes in and out of several thermals. The sun shining through those clear doped bright yellow wings just before disappearing into a deep blue sky was a thrill I will never forget.

It was natural when I did get into radio control in 1971, soaring appealed to me most. The slow, majestic soaring flight of a well trimmed sailplane reaching upward in a warm bundle of rising

air "does it all" for me and probably quite a few other soaring enthusiasts.

The purpose of this letter is to voice a strong concern for a program coming out of the old country called FAI soaring. I feel it is necessary that I stress this is a personal viewpoint, but there may be many others who share the same thoughts. Many of us have worked long and hard trying to solve the riddles on how to keep a ship up longer than the next guy. Now - - - along comes a program rewarding contestants for diving "upwind" and "downwind" faster than anyone else while carrying ballast which, in some cases, may exceed the weight of the model itself. Then, some of the ballast may or may not be removed and a distance event is flown with the laps again being "upwind" and "downwind". Finally, we come to the third round which is a Six Minute Precision thing they call Duration. Some of our Dallas fliers get over six minutes after dark with a 200 meter winch line length! Because of the number of support people required to hold this "European javelin throw" a local National Guard unit could be of real help because the competitors are surely going to tire of it after just a contest or two. Also, how would you like to have the fellow holding down first place waving the turn flag if you were in the second spot? Guess how they determine who wins if there is a tie through all three rounds? Yep, you guessed it; they both dive at the ground again and the flier crossing the final imaginary plane with the highest percentage of sailplane parts and ballast without killing a spectator or damaging an automobile wins. This is not my cup of tea – or – bottle of Dr. Pepper (long live the AMA soaring events!).

Some of my friends and others will say I feel this way because my favorite sailplane is an Olympic 99, but our Texas hawks and turkey buzzards know better.

Yours for better soaring,
Jimmy L. Jones
Richardson, Texas

We think that both viewpoints make sense and wonder how most of you feel? Perhaps the only people who care about FAI are those who are trying for a place on the U.S. Team. How about dropping a line to RCM to let us know if you agree with Warren or Jimmy — we'll keep score and publish the results.

★

WINGS

WINGS (Women In National Glider Soaring) held their bi-annual elections, with the following officers serving through December 1977: **President:** Barbara Robinson, 5841 Schafer Rd., Lansing, Michigan 48910; **V.P. and Editor:** Lila Stamm, 6613 E. 134th St., Grandview, Missouri 64030; **Sec./Treas.:** Karen Toebe, 6128 Marscot Dr., Lansing, Michigan 48910.

This AMA chartered club currently consists of nineteen members representing nine different states. Their goal is to gain members from all the AMA districts during 1976.

As far as we know this is the only avowed chauvinistic group in the country that flies R/C sailplanes. Seems that there should be more gals involved with this group and we ask you to share this with your favorite girl. WINGS plans to field a team at the Soar Nats and is looking for active female fliers.

★

CONTEST NEWS

We received the following contest report from Robin Jaffe, editor of "Thermal and Slope" (this is a very professional soaring magazine from South Africa).

South Africa:

Aquilas took first and fourth place at the South African Nationals out of a field of twenty-five

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entrants. Noel Drew of Durban took first place. Mike Malherbe, flying a Dodgson "Maestro" took second. Nord Gerneke with O.D. took third and Jan Steyne fourth with a scratch-built Aquila. Conditions were poor with light overcast and lots of wind during the three day contest. As you know the world championships are scheduled to be held here on the Reef in 1977, probably sometime in April. April is the start of Autumn here and is usually a good time for soaring. Sunny and warm with a low probability of rain. My brother, Peter, and myself can accommodate up to four competitors in our homes for the duration of the contest and supply them with transport. If any of the American entries are interested we will be delighted to have them. (Write Robin Jaffe c/o Everton Offset, 62 Davies St.,/Straat, Doornfontein, Johannesburg. 2000. South Africa.) Rumour has it that European competition fliers have developed planes that will do ±13 second **speed runs and max out in moderate lift. They are also supposed to be partial to hand tows rather than winch launches.**

Mexico

A series of six contests were sheduled to take place from November 1975 to June 1976, in several sites in Mexico. The purpose of these contests is to select a Mexican Team of three members to participate in the United States Nationals. The results of the first and second contests were as follows:

First Contest
1 — Richard Willie (Aquila)
2 — Richardo Villanueva (Gull)
3 — Mario Fernandez (Windrifter)

Second Contest
1 — Mario Fernandez (Windrifter)
2 — Raul Lopez Breton (Cirrus)
3 — Ernesto Jimenez (Windrifter)

Michigan

Traditionally the Sno-Fly is known to have less than ideal conditions. It has been held at near zero weather, snow storms and high winds. It is probably the challenge of the elements that compels one to enter. This year there was a morning storm that stopped precisely at contest time, except for the winds. A lot of lead and a high wing loading was the order of the day because the wind gusted up to 35 mph. The task for the day was 6 Minute Duration with a 50 foot diameter circle for landing. The statistics are as follows: 51 contestants; 39 Standard Class; 18 Open Class; 4 Junior.

Open Class	
Bud Pell — Super Cirrus	512
Dave Corven — Nimbus	487
Bob Robinson — Grand Esprit	439
Standard Class	
Bob Hicks — Original	602
Dave Leach — Olympic II	439
Jack Cochrane — Aquila	425
Junior	
Kevin Pearson — Aquila	320
Jim Steele — Apollo	244

Alaska

On March 21, 1976, at Fourth Of July Lake near Palmer, Alaska, the "Anchorage League of Silent Flight" had their first contest of the year. The weather that day was clear, calm and with temperatures in the upper 30's. The contest was held on the frozen lake which had 6" of snow on it. 11 contestants competed in a 9 Minute Precision with a maximum of 5 minutes allowed in any one round. Coming in first with a perfect score of 540 seconds was Leonard Oakley flying his Caracara. Second place was grabbed by Larry

Rice with a score of 539 seconds flying a Windrifter. Pete Miller snuck in for third with a score of 537 flying a Glasflugel 604, one second ahead of fourth place finisher George Avila flying a Kestrel 19. Fifth place was secured by Hans Walters flying a Monterey with a time of 533. For the first contest of the year it was quite competitive with the first five places all within 7 seconds. The other contestants finished in the following order: Fred Goff flying a Olympic 99 at 498; Darrel Yonkers flying a Jungfrau at 474 which was his first contest and first time to fly the glider. Darrel may be known to some of the readers as one of our hot power flyers up here and this was his baptism to silent flight. Keith Smith flew a Windfree to 458. Ken Fleshman flew a Lead Sled to 399. Barbara Rice also flew a Lead Sled to 289 - - - her first contest. Last, but not least, was Don Barns flying his Condor for the first time. In fact, he just finished it a few hours before the contest so was unable to test or trim it and only flew the first round as it needed a little tune up. This was also his first contest. Our club is still a small one but we hope, in time, to attract more members who enjoy the silent way. Anybody in Alaska who would like to join, or just be able to fly with us at our various sites and contests, should contact our club secretary, Pete Miller, at 333-9808 in Anchorage. In June we will be making our annual trip up near the Yukon River to circle Alaska for a week of fun flying, contests and swimming at the Hot Springs. On this yearly trip the whole family (including the dogs) go and everybody camps at the several excellent sites in the area. Anyone who would be interested in making this trip or, if living in the area, coming by and flying, should contact Pete Miller. □

ENGINE CLINIC

from page 105/10

and their position on the liner, as well as the angle at which they are aimed into the cylinder. My engine, more precisely, is an OS Max Series 72 H60F GP Goldhead, and I am trying to get as much power out of it as possible for my Deep Vee boat.

I would really appreciate it if you could help me out.

David Coe
Boxford, Massachusetts

Dave, the article wasn't intended to be a "do-it-yourself" type thing. However, since doing the article I have received quite a few inquiries from guys who would like to incorporate the PDP mod themselves. First off I would like to say that the job should be done only by those who have access to a vertical milling machine. If some of you decide to attempt it with you Moto Tool and goof up your engines— don't blame me or John Perry!

The slots are cut with a 1/16" end mill at a 25° angle towards the baffle. The height of the slots is the same as the bypass ports. Connecting channels have to be cut in the crankcase leading to the bypass to bring fuel to the slots. The height of the channels should be at least equal to the height of the PDP slots in the sleeve and bypass ports and as deep as the wall thickness of the crankcase will allow. At least .070" is preferable. A 3/4" O.D. x 1/4" face keyway cutter can be used for cutting the channels in the crankcase. Be sure and leave enough seal area between the end of the milled channel and exhaust stack so that all of your crankcase compression will not leak out the exhaust. This should be a minimum of .135" — .140". This, in turn, will determine the positioning of the slots in the sleeve. You want them as far as possible from the baffle while still retaining an adequate seal area between the slots and the exhaust port.

Dear Clarence,

I have a Sig J-3 Cub which I have been flying for the past 2 years. Up until this past summer it was performing almost flawlessly. Then like out of the blue the engine started acting up.

I am using a O.S. Max H-40 ringed, with a Perry carb which has the brass barrel. The prop is a 10/6 and the fuel is our club formula which is 67% Methanol, 22% Castor, 10% Nitro and 1% Propolene Oxide.

The engine is side mounted and the center line of the tank is about 3/8'' below the center of the spray bar. The needle valve setting has always been on the rich side and never needed adjusting only due to weather conditions. The tank has two lines, the feed line and the overflow. The clunk is heavy brass.

I believe I have given you all the specifics and now to my problem.

After starting the engine and running it up and down a couple of times I taxied it to the strip. Upon advancing the throttle the engine just richened up and quit. Two more attempts were made and finally it was airborne. I put the plane in a loop and on the down side of the loop idled it back to 1/4 throttle. When the throttle was advanced again it richened up and quit. Never before had this happened. Suspecting carburetor problems, I took the carb apart and could find nothing wrong.

No dirt, burrs or anything. After re-adjusting the carb for idle and top end it did the same thing.

I do fly below full throttle quite a bit because with the .40 it is over powered, and take-offs are no problem at half throttle. I took the engine apart and cleaned all the carbon from the piston and head and tried it again yesterday. Still the same old problem.

I've run out of possible solutions so you are my last resort. I hope I have given you enough information to help solve this mystery. Your help would be greatly appreciated.

Sincerely,
Gene De Cook
Canandaigua, New York

Nothing lasts forever, Gene, and I would guess that your engine is just getting tired. After a couple of years of running, it is bound to have had a few lean runs, foreign matter go down the intake (known as dirt), etc. When engines start to wear out they begin losing their compression seal. This means less combustion heat to keep the plug lit. The first indications of an over-the-hill engine is loss of idle, poor acceleration, etc. I recommend you send the engine to World Engines for rebuilding.

Dear Mr. Lee:

I am very confused on the issue of side-thrust and down thrust. Many plans call for both and many plans call for neither. How should one go about deciding what to do on "scratch built" planes or kits that make no mention of this factor?

Also, I have an Enya 45 I purchased from a friend, that does not have a butterfly over the exhaust to create back pressure. Will this engine perform all right with this piece missing?

Sincerely,
Jack Harvey
Hixson, Tennessee

Side and down thrust are throw backs to the old escapement and reed days. Airplanes had to be pretty well trimmed to fly hands off. Down thrust was used to make the transition from power-on flight to power-off flight equal, i.e. without down thrust an airplane, at full throttle, would require down elevator trim to keep from climbing out of sight. However, when the engine was cut it would then go into a dive. Down thrust was used to eliminate the need for excessive down elevator. The faster the airplane went the more effective the down thrust in keeping it from climbing excessively. Side thrust was used to compensate for torque.

Many trainer type airplanes still use some degree of down thrust or side thrust so as to have good transition between high and low speed flight. However, your competition type aircraft seldom use thrust offsets because right thrust upright becomes left thrust inverted, down thrust upright becomes up thrust inverted, etc. Most competition aircraft have everything 0-0. With a competition aircraft the tendency to dive when cutting the power from high to low is still there but with proportional radio you automatically compensate by feeding in a little more up elevator. Some competition aircraft do use a little down thrust — the Kaos for one — so that on landing approach, if throttle is given, the airplane will not balloon.

The purpose of the exhaust baffle on any engine is to improve the idle and particularly the acceleration. It helps to keep the plug hot when the throttle is opened and the cold fuel dumped into the engine. Very few engines will have good acceleration without an exhaust baffle or muffler to help keep the plug hot.

Semco now markets an exhaust baffle adapter that can be used or you should purchase a muffler. If noise in your area is not a problem then I recommend the Semco exhaust baffle adapter.

Dear Mr. Lee:

I have in my possession an Ohlsson 23 and a 60. I am keen on forming an old timers club. Please be so kind as to let me know if there is anyone in the United States who could still offer points, coils, plugs, etc., for these particular engines, also spares.

I read in one of your columns that someone still produces the Super Cyclone engine, please let me have his name, and address, of anyone else who produces spark ignition engines.

Thanking you,

Yours faithfully,
J.F. Harper
Transvaal, South Africa

Since starting the bit on old time engines I have been receiving more and more letters related to sources for old time parts. There is not much available in this line but Mark Fechner — Mark's Model Motors, 112 Clinton Ave., Salt Lake City, Utah 84103 has reproduction timers and timer parts as well as other parts for the Ohlsson .23 and .60. Mark also sells ignition converted models of the old green head Torpedos which he calls his Klondykes. He had temporarily stopped selling the Klondykes for a while, but I understand he will be starting again about the time you read this column.

Ralph Mroch — Remco, P.O. Box 22414, Denver, Colorado 80222 sells the Remco .29 ignition engine. Ralph purchased the tooling and dies for the old Torp .29, did some modifying and updating and now sells the engine as the Remco. Ralph also sells 1/4"-32 spark plugs of his own make (Remco) as well as coils and condensors.

Bruce Chandler — Chandler Engineering, 7858 Farralone Ave., Canoga Park, California 91304, sells ignition converted O.S. engines which he calls his Black Knights.

Karl Carlson, 14600 Ramstad Dr., San Jose, California 95127, now has the remains of the Super Cyclone's and at present is offering parts for sale. I do not know at this time if Karl will be offering complete engines or not.

OK Engines, Box 40, Mohawk, New York 13407, who were the original manufacturers of the OK line of engines have many original parts for sale as well as a 1/4"-32 spark plug of their own make. OK also has coils, condensers, etc.

And, finally, Coles Power Models, Box 788, Ventura, California 93001, sells the Remco spark plug as well as a 3/8"-24 spark plug of their own make. The Coles' 3/8"-24 plug is the equivalent of the old Champion V and the Remco and OK 1/4"-32 plug the equivalent of the old Champion V-2.

That about does it for another month gang. □

CUNNINGHAM ON R/C

from page 6

99% of the fliers will find that all of todays radio systems are very comfortable to hold. Now lean back in your chair, tilt your head skyward, close your eyes, and imagine that your aircraft is flying in the sky, and that you are the pilot. Pretend that it is flying straight and level, and about three hundred feet up, about two hundred feet in front of you and moving from right to left.

Got the picture? The aircraft is flying at about half throttle, so move the throttle stick to the mid, or center location on the transmitter. Don't look at it, just get the correct position by feel. Learn to never take your eyes from the flying aircraft. Get so familiar with the transmitter box that you can move all of the controls without looking at the box. This is very important, and the first lesson that you should learn.

Now, to return to your flying aircraft - - - it is beginning to pull away from you and to get about five or six hundred feet away. Now is the time to make a turn and to come back toward you. **Gently** bank the aircraft to the left. By gently, I mean move the control stick very, very slightly and watch the way the aircrft responds to the control movement. **Don't fly the box, fly the aircraft.** Now that the aircraft has rotated over to its left, very gently pull back on the elevator and watch the airplane make a gentle turn to the left. Depending upon the airplane, after you make the left bank, you may need to return the aileron control to neutral and then pull in the up elevator. As the aircraft begins to head back towards you, give a bit of right aileron to level the wings again and then let it fly straight and true, past you and on to your right where, once again, it is time to make another big lazy turn to the left for another fly-by. Practice this over and over in your mind, giving slight control stick corrections whenever the aircraft begins to wander from a true path.

So much for your first ground school lesson. In fact, since you have done so well, it's time to move from the ground school to the aerodrome for a first flying lesson.

Back to the assumptions. This time we are going to assume that you do have good help at the flying field, and that your instructor is going to follow the same general outline that I am going to present. If you don't have proficient assistance, and cannot locate some, then, perhaps, if you follow this method, some of the rough spots will be smoothed off. I will be the instructor, and you, as the willing student, will do exactly as I say at all times. This will prevent crashes and the resulting hard feelings about a crash. The first flying lesson that you must learn is that when I tell you that I want the transmitter, you will give it to me. You will give it to me without question or hesitation. You may be flying along just fine, and then you may get into trouble and not realize just how serious the trouble can be. I've had it happen, when teaching a newcomer to fly, and when he has gotten into trouble, he wouldn't give the box back. I have yanked a few transmitters away in my time, because I know what is going on with the student. He is frozen to the controls, and the only thing that he can think to do is to give "Up

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CUNNINGHAM ON R/C

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Elevator". "Up" isn't always up . . . and a go model can bite the ground in just a matter of a f seconds. Even with a good instructor, if a froz student delays passing over the transmitter, margin of safety may be gone and the aircraft w gobble up the ground all too quickly. Pass it ove If you don't . . . well, it's your aircraft, not mir But don't ask me to help you again, because won't. And neither will anyone else. Learn take directions and instructions. I don't care you have ten thousand hours in the seat of a f scale aircraft, **flying RC is different.** Su you're going to learn more quickly than the ave age student, but the perspective is different and takes time to adjust to being outside of the aircr rather than within it.

Okay, student, we're now going to fly yo aircraft and to do some instructing along with t flight. Bring your airplane over here and set down. Give me the transmitter and turn on t receiver. What is your frequency? You cannot at this field without the correct frequency flag your antenna. See that elevator on your aircr jumping around? Look over there — that g flying is on the same frequency as you are! If y or I had turned on your transmitter we would ha shot down that particular flier. **Be careful!** At t field we don't fly unless you have the frequen peg in your pocket. Turn off your receiver a wait until that flier lands and taxis back to the pi While you're waiting, go up and down the flig line and see how many other fliers are on the sa frequency as you.

Now that we are clear to fly, let's check your controls and see just how the surfaces mov Hand me the frequency peg, and turn on yo receiver switch, while I turn on the transmitt Everything looks good, the ailerons are movi correctly, and the nose gear goes the same w that the rudder does. Let's add a few more rubb bands to the wings, 10 to 12 is the minimum o ship as large as this one. While we're strapping the extra rubber bands let's check the balance the aircraft. I'll just pick it up here about a third the way back from the leading edge. Hum, jus little nose down — great, let's fire up the eng and get into the air.

Have you run the engine before? Two tanks the driveway! Bet that made your neighbors sup happy. Well, start her up and let's see how s sounds. Nope, too lean. Here, let me back off the needle valve a bit - - - you've got a n engine here and it should be running nice a rich. When it's broken in you can lean it out b for these first few test flights, I want it runn just rich of two cycle.

Now stay with me while we taxi out for ta off. Do you see any aircraft coming in for landing? All right, now we will taxi down wi make a 180 degree turn back into the wind, a get ready for take-off. Let's check all of the co trols one more time.

Everything works, so here we go. I'm going start feeding in full throttle in a nice even forwa movement. There is no reason to jam the thro to full bore, just feed it in nice and easy. No watch the aircraft tracking down the runwa building up speed. Now, I am going to ease ba on the elevator just a bit, see the aircraft begin rotate, add just a bit more elevator, and she lifting off of the runway and climbing out in a n shallow take-off run. Let's increase the climb r with a bit more up elevator and get about t hundred feet of sky.

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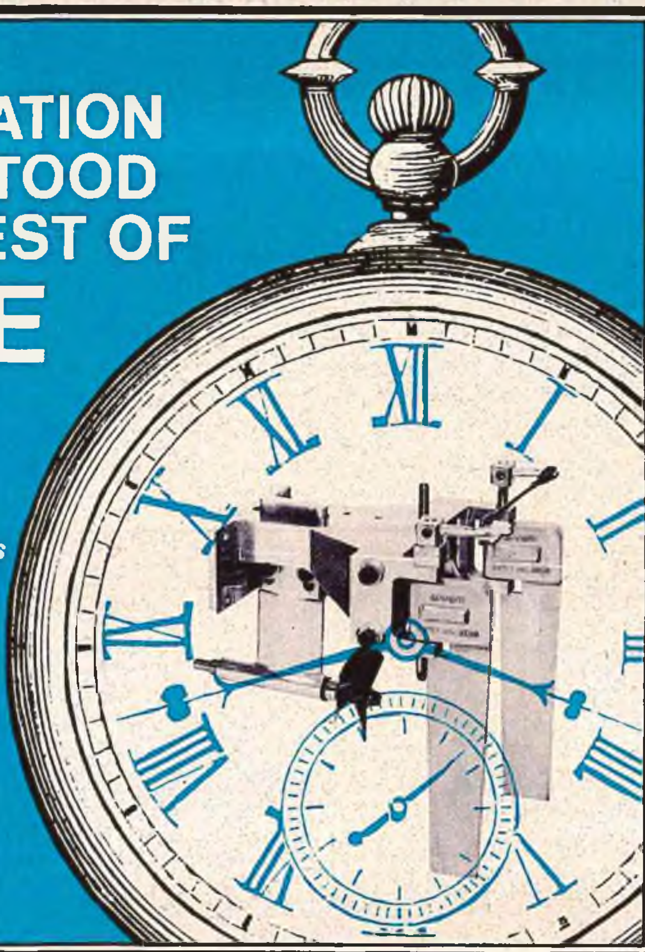

CUNNINGHAM ON R/C

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Now we are going to make a turn and come back in front of us. The aircraft is flying well, it just needs a touch of up trim and a bit of right aileron trim to fly out nice and level. Now, I am going to make a couple of turns around the field to see that everything is working just right, grab a bit more sky, throttle back, and give you a chance to see just what you did learn in ground school. Stand over here to my left side, and I will just lightly hold onto the bottom of the transmitter while you take the box between your hands.

Keep watching the aircraft, and don't look down at your hands. Got your thumbs on the sticks? Okay, now, let's make a nice gentle turn to the left. Just a bit of left bank, and then a bit of up elevator. Watch her come around, nice and easy. Now, just a bit of right aileron — whoops, too much. Now a bit of left aileron and level her out. Fine, now keep on that same heading. Nope, you're holding in some up elevator and she is climbing. Just relax and let the control sticks neutralize under your thumbs. That's it. Easy now, just let her fly for a bit.

Now, it's time for another big turn to the left . . . not too much aileron, just a bit of back stick. Fine — you're doing great. Let her fly toward the North, take a deep breath, your knees are making so much noise that I can't hear the engine! Great. Now, one more turn to the left and bring her back towards us one more time. See that wing go down? You've got to correct for the low wing. Move the aileron stick in the same direction as the low wing. There, the wing picked up and she is back on level flight again. Remember, when the aircraft is flying toward you, the control functions are reversed to your eyes, and, rather than think left or right aileron or rudder, just remember to move the aileron control stick in the same direction as the low wing.

Well, you've been making nice big lazy left turns for some time now, so I think that we had better land, and give you a rest. Hand me the box and we will set up for a landing. Watch what I make the aircraft do. We will give you a shot at landing after you have a few more flights under your thumbs.

First, we will land in the same direction as we took off — **into the wind.** Let's make a fly-by over the field about one hundred feet in the air, going into the wind. Now we make a turn to the left and cut the throttle about one half. We will fly about two hundred feed and then turn left again. We can drop the throttle a bit more here, depending upon the way that the aircraft is flying, and the wind that we are having today. All right, we have gone about three hundred feet beyond the end of the runway so it's time for another left turn again. We make one more left turn and line up with the runway. Now, we chop throttle to about one quarter and watch the aircraft begin to settle. Let's back off a bit more on power. Now she is gliding in toward the runway with her nose just a little high. We are over the end of the runway, about five feet above the ground. Now, I'm going to chop throttle to fully closed, there, she just settles down on the main gear, now the nose wheel touches down and it is rolling along the runway. When she loses speed, we will turn and taxi back. If you try and turn too soon, the aircraft will tip over, and you will have broken a prop.

Here she comes - - - let's taxi back to the pit area, and then we will stop the engine. Nope, don't throw a rag into the prop, reach down and pull the fuel line off of the throttle. Hold on to the aircraft because she will speed up a bit as she runs out of fuel.

Well, now we have completed the first flight on your new bird, let you make a few turns around the field, and the only thing left to do is tell you where the rest room is so that you can be more relaxed for your next flight. But first, put the frequency peg back in the rack so that the next man up can fly. You did turn off the receiver when you picked up the aircraft, didn't you? I turned off the transmitter.

There you have it gang, a thumbnail sketch on how to fly in your minds eye and get used to the transmitter functions, and a brief trip through your first test flights. I hope that you have good luck with your flying, because once the bug bites you, the disease is almost always a sure thing and you're going to be hooked for a long, long time. Welcome to the greatest hobby and sport in the world. One that you can enjoy through building and covering, flying, and just plain hangar flying.

Good luck, and see you at the field. □

FROM THE SHOP

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.... sailplane contest with only 7 frequencies?

As a starting point, RCM would strongly suggest that the AMA frequency committee petition the Federal Communications Commission for no less than 5 frequencies in the 30-40 MHz frequency range as well as an additional frequency in the 72-75 MHz range. We would also urge the radio manufacturers to explore the usage of single sideband, both upper and lower as is currently being done on the Class C Citizens Band frequencies. This, to be certain, would increase the cost of our current radio systems, but would triple the number of existing frequencies. I'm not an electronics technician - - - and, in fact, have very little knowledge of electronics - - - but I can't believe that this cannot be accomplished. If the Citizens Band radio manufacturers have the technology to produce upper and lower sideband frequencies on radios and sell them in the $300.00 to $400.00 range, there is no reason why our radio manufacturers cannot explore this possibility. We can do without spin buttons, roll buttons and the like that increase the cost of our radio systems and put that additional cost into a feature such as SSB which would increase our frequencies which seem to be diminishing at an alarming rate!

Another thing that can be done is something that each and every one of us can do — and that is for every single individual RC'er to make sure that he has a current FCC license to operate his equipment. Apparently we're playing a game of numbers — the greater the numbers, the more attention you get. So it would behoove each and every one of us to maintain a current valid FCC license issued on an individual basis.

Don't put it off - - - it looks like tomorrow might just be too late!

★ ★

Another episode in the story of "It's okay to fly, but don't do it here," has recently been written by the experience of the Mt. Ranier Radio Control Society in the Tacoma, Washington area.

In 1969 this AMA chartered club of some 50 current members leased a site approximately 15 miles from the city on flat ground with a fly-over area of 140 to 150 acres in a "fat ell" shaped configuration. In the notch of the ell was a vacant extension of a high school athletic field. At the base of the ell, a single house, and at the top was a group of small development dwellings.

A surfaced 300 foot runway and fenced pit section had been built and due to the shape of the area the club could fly over either one or both parts of the field. The accessible perimeters were fenced and the only legal entry was by the use of two gates which were kept locked when the field was not in use as each member was supplied with a key.

Everything went well until 1974 when another row of houses was built almost adjoining one boundary of the field and admittedly, a few occasional and avoidable over-flights of the newer dwellings were made by club members. A threatening complaint was made by a resident which finally resulted in the clubs request to the County for a decible meter count to compare a direct over-flight to other regular neighborhood

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noises such as lawnmowers, motorcycles, etc., prevalent in the housing area. A .60 powered model aircraft was found to be considerably less noisy than the other machines but, in spite of a definite effort to avoid the houses, the complaints persisted, primarily instigated by one individual.

Additionally, the club's cause was severly damaged one week-end when the field was loaned to a club from another city for pylon races and in conversation with one of our nearby residents, a member of that club told him, "keep out of the way, these things are dangerous, they can kill you." It is certain that, that neighbor had his small children in mind as he departed and, though the statement may be true, it is equally true of a golf club, baseball or hockey stick and reflects pretty poor thinking when we should be trying to create an interest and understanding of our sport in the minds of our neighbors and not try to antagonize them with our own thoughtless and threatening bravado.

Also, there was considerable evidence that, during some week days when no one from the club was present, outsiders passed through the fences and disregarding a 4' x 8' sign indicating proper flight limitations and regulations, the intruders flew by their own rules.

Regardless of continued efforts on the club's part to confine their flight patterns, tension in neighborhood relations constantly deteriorated. Juvenile trouble makers knocked down the club's

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fences, overturned the outhouse, smeared paint over their signs, threw garbage, bottles and cans on the runway and cut and destroyed the heavy ground matting covering the pit area. Threats were made to shoot down their aircraft and while no bullet holes were found, several shot gun blasts were seen and heard. Also, it is believed that the chief instigator of the groups troubles, who had a large radio antenna on his house, may have been responsible for some otherwise unexplained crashes.

The result of this pressure and harassment is a situation in which the Mt. Ranier Club was afraid to fly at their own field and necessitated a termination of their ground lease, the abandonment of a convenient location, and the facilities developed over several years of effort and expense. Not to be discouraged, however, after many weeks of hunting, a new site has been found in a beautiful sloping valley, but with the distinct advantages of being a further 10 miles out. A new flight strip with pit and parking areas has been graded and the club hopes it all can soon be surfaced for year round use.

To the best of their knowledge, at no time did the Mt. Ranier group violate any zoning ordinance restricting their activities nor any statutes declaring such activities unlawful or prohibited in the area, nor did they disobey any anti-noise ordinance. No complaints from the nearby school nor from any county or other legal authority have been lodged against them. Pressure, induced and stimulated primarily by three or four individuals backed up by vandalism, gun shots, and radio interference, which cannot be proven with sufficient evidence to bring any individual to trial, has accomplished its insidious purpose and made it unsafe for them to fly at that location.

If there is a lesson to be learned from the Mt. Ranier experience, it may well be a realization on our part that we are participants in a sport that requires a great deal of space and close regulation of flight patterns where there is any possibility of over-flying or otherwise causing an unusual annoyance to residential properties. Unfortunately, our sport offers recreation and enjoyment to a relatively small number of persons in relation to the space required if compared to practically any other sport and, due to that fact alone, we are pretty vulnerable. Conformance to legal ordinances or restrictions is no guarantee that certain individuals who feel that we are an annoyance will not use fair means or foul to cause trouble and, once it has started, it is most difficult to stop. It resolves itself into a case of "compromise to get out" and in the Mt. Ranier case they could not effect a compromise so they simply "got out"..

★ ★

The following letter was received from Air Force Sargent Ken Eaton of Mather Air Force Base, California:

Dear Don:

Most of us in the R/C hobby are very safety minded when it comes to our enjoyment of our models. As ground safety monitor for our CCTV shop here at Mather AFB, California, I am constantly being presented with much safety information and many safety bulletins. In a recent bulletin for the base I came across the enclosed article. It is a reprint from the NCS Aerospace Newsletter, it would be beneficial to all of us modelers if you could reprint it in R/C Modeler Magazine.

"At the Labor-Management Safety Conference held in Vancouver, an eye specialist described a

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hazard that could affect each of you and your familes. That hazard is the catalyst (or 'hardener' or 'accelerator') that is added to fiberglass resin before the resin is applied. The eye specialist told us that a drop of this catalyst in the eye will progressively destroy the tissue of the eye and result in blindness. This will occur even though an attempt is made to wash the catalyst from the eye. Furthermore, once the chemical has started to destroy the eye, there is no known way of stopping the destruction or repairing the damage.

"During his talk the eye specialist showed us a colored slide of an eye damaged by this chemical. He showed many other slides illustrating eye problems that can occur if the eyes are not properly protected. Some of his slides were so unplesant to look at that several people left the room. However, the slides certainly illustrated the point he was trying to make, namely, when handling chemicals of any kind appropriate eye protection must alwyas be worn.

"The hazard associated with fiberglass resin was unknown to those of us who attended the conference, although many of us had used fiberglass resin at home or at work. The hazard may be unknown to you also, and to your wives and children who may also use a similar kind of resin and catalyst when working with fiberglass (or with some hobby kits now available). I hope you will bring this hazard to the attention of your wives and children. The cost of a pair of safety goggles is a very small price to pay for the protection of their eyesight – and yours."

Our hobby is too much fun to be ruined by the loss of an eye due to carelessness.

Cordially,
Ken Eaton
Sgt. USAF

★ ★

In closing this month, we noticed a comment by Bob Maran writing in the "Smoke Signals" newsletter of the Meroke Radio Control Club Incorporated:

"Ever wonder about the reliability of those living type hinges? Having used the pin type exclusively, I was a bit dubious about the durability of the hinge material included in my Quickie 500 kit. Therefore, I set up a simple stamina test using an old electric motor from an Erector set. Three hinges of this type were tested, an E.K. Logictrol, a Sig, and a half inch cut from living hinge material. A pushrod-type linkage was hooked up between the motor wheel and each hinge tested. The hinge flexed approximately 45 degrees in each direction in accordance with the push-pull of the rod. Total flexures were 92 per minute. The apparatus was run for two hours, giving a total of 11,040 bends. All three hinges appeared as good as new with no discernible decrease in tension. My personal conclusion - - - the life span of a living hinge will far exceed the life of my plane!"

★ ★

Part II of Ducted Fan Design Principles has been delayed due to a delay in the mails, and will be presented next month. Watch for it!

★ ★

That's it for this month — we hope you enjoy this special Bicentennial issue of R/C Modeler Magazine. And, like the old saying goes - - - "Keep those cards and letters coming, folks" - - - but, in this case, mail them today to the AMA Frequency Committee in Washington, DC and let them know you care about the future of this great sport and hobby of radio control. ☐