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R/C MODELER

THIS MONTH'S COVER

features two patriotically painted Byron — C.A.P. 21 model airplanes built by Harold Roberts and Tom Jacomini. Their power is Quadra and the radios utilized are Kraft Signature. Transparency by W. Barry Wilson of Wilcom, Inc., Houston, Texas.

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FROM THE SHOP

RCM STAFF

Clarence Lee
Model Aviation Hall Of Fame

Clarence Lee was inducted into the Model Aviation Hall of Fame in 1983. Clarence, who is world renowned for his model engine expertise, has been an Associate Editor of R/C Modeler Magazine with his monthly Engine Clinic column since the January 1969 issue.

The induction ceremonies and plaque presentation were conducted most appropriately at the NMPRA National Championship races at San Luis Obispo, California. Clarence has been involved in high performance racing engines since he was racing hot rods on the California dry lake beds in the late 1930's. His first model airplane engine was a Bunch Mighty Midget which he obtained in 1937.

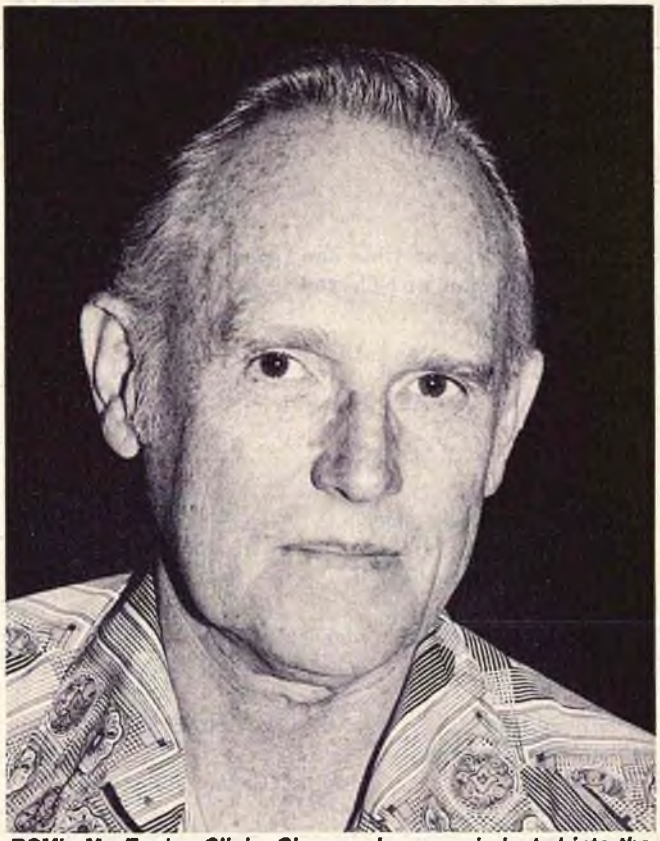
As was the case with many modelers of that era, Clarence became a pilot with the U.S. Army Air Corps during WW II. Most of his duty involved flying the hump in the China, Burma, India theater. His war stories are unreal.

He designed and built his first model engine in 1946 which was followed by many special purpose engines in small quantities. Several of these were used to set new records in control line and free flight.

In July 1959, Clarence delivered his first Lee 45. This engine immediately established new standards of performance and reliability for the newly emerging radio control enthusiasts. The customers' names in the serial number log books for the Lee 45 reads like a Who's Who of radio control pioneers. Production rights for the 45 were eventually sold to Veco who marketed this engine for many years.

In 1964, Clarence was commissioned to develop a .19 for Veco and this little jewel is still in continuous production having been taken over by K & B several years ago. Another commission for Veco was the .61. Serial No. 001 was delivered to Cliff Weirick in July 1965, and was installed in a Stafford Chipmunk that Cliff flew in the World Pattern Championships in Corsica. This engine was also taken over by K & B and is the forerunner of the revered K & B .61.

In recent years Clarence is probably best known for his customizing of engines for racing airplanes, cars, and boats. Not only does he rework engines but he shares his expertise with those who want to do it themselves. He is a familiar face at flying fields, car tracks, and boat ponds on the West Coast and is willing to assist anyone having engine problems.



RCM's Mr. Engine Clinic, Clarence Lee, was inducted into the Model Aviation Hall of Fame in 1983.

Besides his own innovations in model engine design, Clarence has kept abreast of engine development worldwide. He is also well-informed on fuel, lubricants, tuned pipes, propellers, and other areas related to model engines. As a most competent R/C pilot he can relate to the real world engine usage. His product reviews are highly respected as he has the reputation of "saying it like it is" as compromise is not in his vocabulary.

This resume barely scratches the surface of his qualifications in the field of model engines. We are proud to have Clarence Lee as a part of the RCM family and feel that the honor bestowed upon him by his peers is well-deserved. Our deepest respect and congratulations are extended to Clarence Lee. □

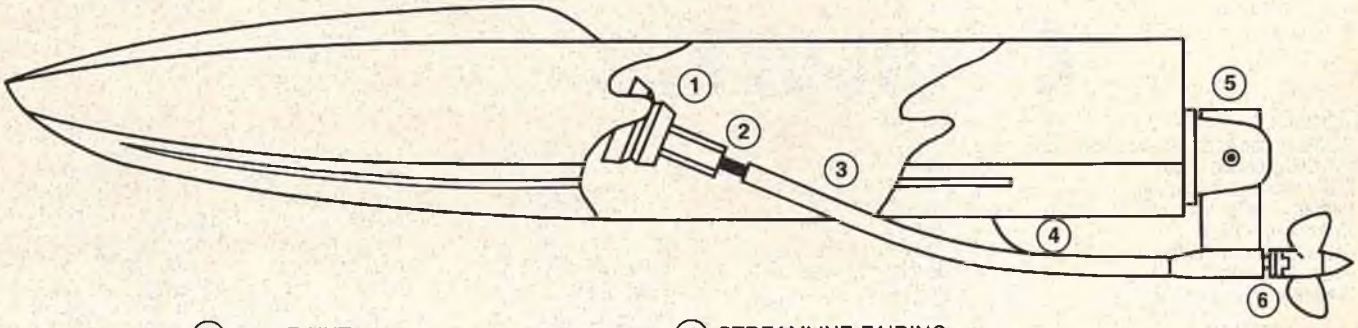
POWER BOATING

Howard Power

The use of cable propeller drives has been increasing in recent years to the point where it is the rule, not the exception. These systems give most people very few problems, but, like anything else, you have to follow proper installation techniques for trouble free operation. Figure 1A shows a typical set-up that most people use, especially on deep vee or monoplane boats. This set-up uses a drive shaft made up of the cable and a stub shaft that is hard silver soldered to its end. These shaft assemblies are available from many manufacturers. If you use needle bearings in your strut be sure to use a stub shaft assembly that is hardened properly for long wear. If you use teflon or oilite bushings in your strut, the stub doesn't have to be hard. I have had nothing but good luck with the shaft assemblies made by Hughey Boats (P.O. Box 68328, Indianapolis, Indiana 46268). Ed supplies various diameters, lengths, and stub configurations that are just the right hardness for your application. The solder joints are accurate and strong. The modeler can solder these assemblies but it takes a jig to hold the cable and stub aligned during soldering. You have to be very careful not to overheat the cable during soldering or a weak area is produced which leads to breakage. This job is best left to those who have the soldering skill and tooling required to do an accurate, strong job.

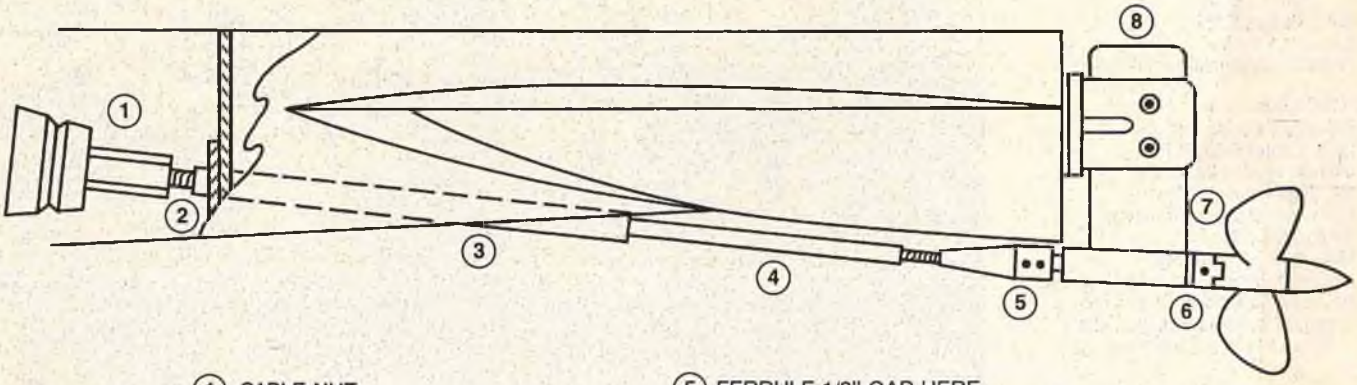
The cable slides into the strut assembly and into a stuffing box tube that is glued into the hull. The stuffing box tube is bent in an "S" shape which reduces cable drag and allows the cable to slide into alignment with the cable clamping nut. I have had the best luck using K & S brass tubing available at any hobby shop for this stuffing box. Others use a teflon tube that is unsupported. If you use this latter system, a short length of brass tube is glued into the hull so that the teflon tube may be replaced. The teflon system offers no protection for the cable during collisions and very little support when the cable deflects

to page 11



1. CABLE NUT
2. FLEX CABLE
3. BRASS STUFFING BOX
4. STREAMLINE FAIRING
5. STRUT
6. 1/16" GAP BETWEEN STRUT & DRIVE DOG

FIGURE 1A: TYPICAL MONO CABLE DRIVE SYSTEM



1. CABLE NUT
2. 3/16" FLEX CABLE
3. 9/32" O.D. STUFFING BOX
4. 1/4" O.D. BRASS TUBING
5. FERRULE 1/8" GAP HERE
6. THRUST WASHER — NO GAP
7. DRIVE DOG & PROP
8. STRUT

FIGURE 1B: HYDRO DRIVE LINE ASSEMBLY DETAILS

when loaded by the propeller. I believe that propeller efficiency is increased and hull drag is decreased by using a streamline fairing behind the stuffing box tube. If you use the teflon tubing method it is almost impossible to use such a fairing. The cable is lubricated with Sta-Lube boat trailer wheel bearing waterproof grease.

The cable is cut to the proper length and its end is soldered using a 45% silver content hard silver solder. Hughey Boats sells an excellent solder and a borox type flux that we use exclusively. You will need a propane torch to heat the cable until you tin the end. Be careful that you don't overheat the cable. Just bring it to a red color and let the solder melt into the cable. Let the end cool in the air. Do not quench in water or oil as this will change the temper of the wire and will cause premature breakage. If your cables are breaking close to the cable nut you either are not soldering the end properly or you have a misalignment between the cable nut and the stuffing box. The cable is slid into the cable clamping nut so that there is a 1/16" gap between the strut face and the thrust washer. This gap is required because the cable length changes under a load. If you do not use a gap at the strut, the cable will bind under some loading conditions and reduce rpm. If you leave too much gap, the cable will buckle when the prop pushes the drive dog forward. This type of cable set-up almost always produces a thrust load on the motor. You should inspect the flywheel collet often because the thrust load tends to push the collet into the engine front bearing and cause wear on the collet face. Many manufacturers make cable clamping nuts. The two most popular cable nut types are the clamping collet type or the set screw type. It is important for best performance that the cable nut runs true without wobbling. Hughey Boats is a good source for the set screw type which runs out almost perfectly. The collet type of nuts suffer from distortion when tightened improperly. You need to watch this carefully and replace the nut when it starts to wobble. Steve Muck (6003 Daven Oaks Drive, Dallas, Texas 75248) manufactures a collet type nut whose design insures that it runs very true even when tightened by a gorilla. Be sure to leave a 1/4" gap between the face of the clamping nut and the end of the stuffing box tubing so that you can get your starting belt between these components after the engine is bolted into the mount.

Figure 1B shows a cable set-up that we recommend for hydroplanes. The propeller, drive dog, and thrust washer are mounted on a hardened 3/16" diameter stub shaft. The flex cable has a ferrule soft soldered to one end which has two set screws to fasten it on the stub shaft. No Loctite is necessary to hold these tightly in place. The cable runs in a brass tube as in the monoplane set-up. If you use the normal set screw or cable clamping nut to restrain the cable to the engine, you must leave a 1/8" gap between the front face of the strut and the ferrule. The length of the cable used on most hydros is such that, when loaded, the

cable increases its length. If the previously mentioned gap is not provided, the cable compresses and breaks close to the engine nut. Again, we have a situation where the cable pushes on the engine causing wear on the flywheel collet because of the thrust load.

I had been looking for a better way to drive the normal cable drive system for a long time. A couple of years ago at the Los Angeles Nationals I noticed that John Perry (of Perry carburetor fame) was using just what I was looking for. John had a drive cable with a squared end which slides in a square hole punched in the normal hexagonal steel engine nut. This type of coupling has been used for many years in the K & B outboards but why nobody else had thought of its use in inboard set-ups is beyond me. With a sliding fit, the cable can grow or shorten as it wants to and doesn't put a thrust load on the engine. The motor runs better and the cable lasts longer. The cable nut described is a perfect match for the hydro drive line described in Figure 1B. The gap in front of the ferrule is no longer needed and the strut keeps the cable from pulling out of the drive nut when the boat decelerates. If you loosen the ferrule set screws the whole drive line can be taken out for cable greasing. We have tested this set-up on our 45 and 65 powered hydros for most of the last racing season. There have been no failures and the system has worked perfectly. You don't have to worry about tightening the cable nut set screws or tightening the clamping collet. Once the cable is inserted into the nut it cannot slip unless the cable breaks. Since the cable is only soldered on one end (and at a very low temperature) the cable strength is not adversely changed anywhere along its length. This system seems to have definite advantages over the rigid systems used in the past.

If any of you would like to try this system, I am making cable nuts available to fit 1/4-28 and 8mm x 1.25 crankshaft threads. These nuts will fit the following engines: O.S. 46, K & B 7.5, OPS 40 and 45, the new Picco 45, Rossi 65, K & B 67, O.S. 65, and Picco 65. The nuts are hardened and have a nice black oxide finish. The square drive hole is sized for use with 3/16 cable only at the present time. If consumer response is what I think it will be, we will expand the thread sizes available and make nuts available for the smaller size cable used on 3.5 sized boats. These nuts are available now from Power Products (766 Broadway, Seaside, California 93955) for $5.95 each. Power Products will also form your drive cable (for $2.00) into the necessary square shape to fit into the cable drive nut. Drive cables of various lengths with preformed square ends are also available for $1.80 per foot plus the $2.00 forming fee.

★

Dear Mr. Power,

I purchased a K & B .45 outboard and Hotshot 45 fiberglass boat. Ever since I got it I've had nothing but

When writing to an advertiser, be sure to let them know that you saw their ad in RCM.

trouble. I've burned out glow plugs like they are going out of style. I've only been in boating for two months and I guess maybe I don't quite know what I'm doing. Tonight after supper I put a new plug in the engine and it ran for ten seconds using Sig 15% fuel and broke the rod between the piston and crank, plus broke the bottom part of the piston. The engine has a total running time of no more than two minutes. What a way to start boating, huh?

I would like to know what to do and where to send for parts. After all the money spent on boat, motor, radio, fuel, starter, battery, etc., I don't know if I can afford it. I don't want to buy parts every two minutes that the motor runs. Also, what special glow plugs, if any, should be the best for a boat? And, also, fuel-wise, what percent nitro, brand? Anything you can help me with to keep from spending this much needed and very extinct green stuff?

If anyone can help me I know you can. I have much faith in your boating wisdom.

Roger Kelderman
Oskaloosa, Iowa

New boaters seem to have trouble operating safely the racing engines most of us use. The K & B 7.5cc outboard engine is a quality motor that, if used properly, will give you many **hours** of operation without even using two glow plugs. You are using the right fuel to start with. Sig 15% fuel is very mild and has castor oil as a lubricant. This is a perfect example of a good sport fuel that should not give you any trouble. If you are burning out glow plugs you probably are running the engine fuel mixture too lean. You need to set the high speed needle valve so that more fuel is supplied to the motor. Read the instruction sheet again and set the high speed needle as they suggest. Then turn the needle out one full turn from the recommended number of turns. This will insure that the motor will start slobbering rich on the high speed setting. The K & B engine has a very good carb that also has an idle needle valve. This needle is in the form of a slotted screw on the side opposite of the high speed needle. Be sure that this needle is set rich (rotate counterclockwise to turn the needle out) according to the instruction sheet. Blow air into the carb through the fuel nipple to be sure that the carb fuel passages are not plugged.

Another problem could be that your fuel tank may not be capable of supplying the carb enough fuel. Be sure to connect the engine pressure fitting to the fuel tank vent using a piece of fuel line tubing that has no leaks. Fuel pressure is necessary for consistent running. Be sure that the vent tube and the fuel pickup tube are not plugged or split. If you use a third fill tube in your tank set-up, be sure to plug this before starting. The pressurized fuel system is closed (it is not vented to the atmosphere). The fuel nipple of the carb is connected to the tank pickup tube by another piece of fuel line. Check to see that the fuel tank system has no leaks.

You are now ready to try to start the motor. Set the throttle so that it is about 1/4 open. Do not start on high throttle. Apply the starter and the motor should start and run very sloppy. In fact, it may die from too much fuel. If it revs up fast you have a fuel feed problem and you better find it before going any further. Recheck your fuel system and fix it. Once the motor is running rich you can carefully turn the high speed needle in until the motor runs fast **in the water.** Don't peak it out on the bench because the unloaded rpm of any racing engine is astronomical. If you over-rev the motor the rod will break as you have experienced.

If you are still burning out glow plugs it may be because the combustion chamber button is too close to the top of the piston when it moves to the top of the cylinder. The K & B engine comes with thin shims between the head button and cylinder liner. The head clearance (distance between the bottom of the head button and the top of the piston when it is at the top) should be no smaller than .010". Most people run about .015" for high nitro fuel or for better glow plug life. If you can't measure this head clearance you can put all the head gaskets that came with your engine under the head button so that the head is plenty far enough away from the piston. By moving the head button out with the gaskets you will decrease the pressure in the combustion chamber so that the plug is not damaged.

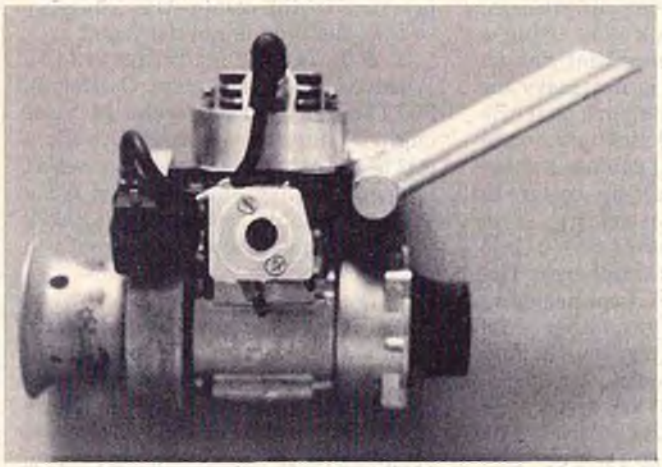
K & B Manufacturing (12152 Woodruff Ave., Downey, California 90241) has parts to rebuild your engine. I suggest you send it to them with a letter explaining what happened. They will repair it for a very reasonable cost and will check out the head clearance and carb if you ask them to.

★

Well, that does it for another month. Send your questions, comments, etc., to the address at the end of this column. If you desire an answer before magazine publication, enclose a stamped self-addressed envelope. Howard Power, Hobbies Unlimited, 766 Broadway, Seaside, California 93955, (408) 394-1200. □

RCM PRODUCT REVIEW

American R/C Helicopters
ATLAS VAN LINES



SPECIFICATIONS

Name	ATLAS VAN LINES
Boat Type	Hydro 1/5 Scale
Manufactured By	American R/C Helicopters 635-11 North Twin Oaks Valley Rd. San Marcos, California 92069
Mfg. Suggested Retail Price	$450.00
Available From	Both Mfg. & Retail
Hull Length	68 Inches
Beam	34.5 Inches
Mfg. Rec. Engine Range	50cc Quadra, 70cc Hornet
Recommended Fuel Tank Size	16 Oz.
Rec. Control Functions	Rud., Throt.
Basic Materials Used In Construction:	Fiberglass, Plywood, Foam, Balsa
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (19 pages)
Construction Photos	Yes (8 pages)

RCM PROTOTYPE

Radio Used	Airtronics XL 3 Ch. Wheel
Engine Make & Displacement	50cc Marine Quadra
Tank Size Used	16 Oz.
Weight, Ready to Float	26 Lbs.

SUMMARY

WE LIKED THE:
Completeness of kit, excellent glass work, very complete construction and photo booklets.

WE DIDN'T LIKE THE:
Nothing here to dislike.

With airplanes getting bigger and bigger, it seems only natural that R/C boating enter the giant scale era as well. American R/C Helicopters have done just that with the release of their 1/5 Scale Atlas Van Lines unlimited hydro.

In what appears to be a mattress carton measuring 70½" x 38" x 9", you will find everything neatly packed for safe shipment. Just about everything but the hull and plywood is packaged in its own plastic bag for easy identification. One can't help but be awestruck by the incredible size and quality of this kit. All plywood, balsa, foam and complete hardware package, including prop, come with the kit.

Construction:

The 19 page instruction manual and 8 page photo manual are very well-done and, if strictly followed, will make construction a breeze. The hull and deck are made of high quality epoxy fiberglass. The stringers and bulkheads are made up of plywood, balsa and foam. These do not come cut to size, however, a set of full size templates are included. All one has to do, is apply a small amount of contact cement to the back of the template and lay them on to the wood and cut them out on a bandsaw or Dremel type saw. All wood parts were given a thin coat of Hobbypoxy II to protect against possible water and fuel damage. These pieces are built directly into the hull using Hobbypoxy I, II and GE silicon glue. After the framework is completed, the deck is

to page 22

fastened to the hull with Hobbypoxy III and silicon producing a sturdy and warp-free boat. The cowlings are made of the same epoxy fiberglass as the hull and deck. The front cowl is epoxied to the deck while the rear cowl is removable for access to engine and radio.

The rear vertical fins and horizontal stabilizer are constructed of foam cores with balsa sheeting. After the sheeting and tip blocks are glued in place, they are covered with 3/4 oz. glass cloth for strength and durability.

As mentioned previously, all hardware is included. All pieces are of high quality material. The stuffing box and strut are blue anodized and are fitted with needle bearings for minimum drag. The stuffing box even has a zert fitting to make drive shaft lubrication easier. The rudder and turn fin are both machined aluminum and you even get an Octura 1475 prop with the kit.

All parts in this kit fit well and go together very fast. This is a kit that even a beginner should have no trouble building.

Paint (Finishing):

The entire boat was primed with one coat of acrylic enamel primer. Any pin holes that showed up were filled with acrylic putty and then sanded with 220 grit paper. Two more coats of primer were shot. After a quick check showed that all pin holes were filled, the boat was sanded with 400 grit paper, "wet." A base coat of white was shot followed by light blue and the dark blue trim. All of the paint used was Dupont acrylic enamel.

A set of decals, which include the name for the top of the hull and side of the front cowl, the "A's" for the tail fins, the #1 for the nose and the U number, are available as an option at a minimal fee. These decals are nicely made of self adhesive backed mylar. These sure do save a lot of time and trouble on your paint job. After the decals were applied, two coats of clear were shot to protect everything. After the paint job was finished, the hardware was installed.

Engine:

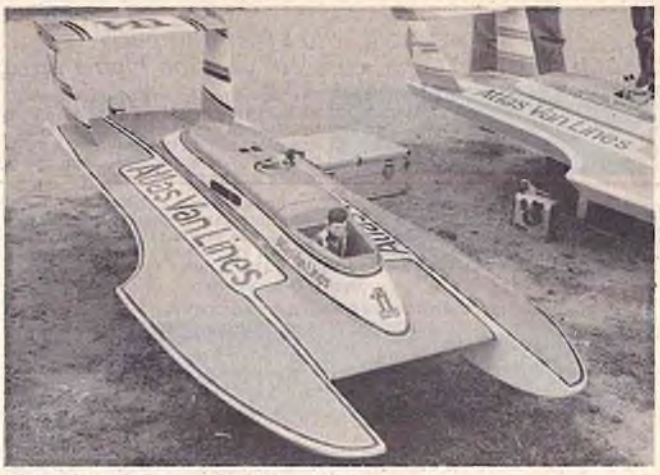
The engine used in our Atlas was the new Quadra 50cc. This engine is being converted for marine use by American R/C Helicopters. They are fitting the engines with a water jacket for cooler running. The Quadra 50 has enough power to move a 26 pound boat in the 50 mph range. When fitted with the 70cc Hornet engine, prototypes have run in the 80 mph range. This is quite impressive for a boat of this size.

There is enough room in the nose of the boat for a 16 oz. tank which will give plenty of run time.

The engine is connected to the drive shaft with a pair of pulleys and drive belt. There are different size pulleys available to alter prop rpm.

Radio:

There is more than enough room in the hull for even the largest radio. A Tupperware-type radio box is suggested in the instructions, however, we chose to build one directly



into the boat using scrap plywood. This produces a very watertight unit. Two Airtronics' 94509 heavy duty waterproof servos were used for the rudder while one 94554 ball bearing coreless waterproof servo was used on the throttle. Due to the tremendous strain on the servos in a boat this size, a 1200 mah receiver pack was used. The rudder was hooked up with NyRod type pushrods and the throttle was connected to a flex cable type pushrod system.

Running:

At 26 pounds, the Atlas is light for the power available. The boat is quite agile for its size and handles like a dream. At 50 mph the Atlas looks just like the real thing. Its scale-like appearance on the water is a real sight. At around 80 mph, the only word that can be used is awesome.

Because the motor is fitted with a centrifugal clutch, the Atlas can be dry launched. It other words, the boat can be set in the water and will not take off until the throttle is advanced. This way you stay dry and it is also a lot safer than trying to throw launch a 26 pound boat.

By the way, the horizontal stabilizer is completely functional and can be adjusted to help lift or lower the running attitude of the rear of the boat.

Conclusion:

The Atlas Van Lines is a well-designed boat with quality throughout. This is a kit that anyone could enjoy building, beginner or expert. With the Quadra 50, the Atlas is easy enough to drive for just about anyone, however, we would not recommend the Hornet engine be used by anyone without at least some driving skills. Because a gas engine is used, there is very little operating expense. There are no glow plugs to burn out or expensive fuel to eat at your wallet.

The Atlas Van Lines is an excellent choice for anyone looking for true boating pleasure, whether it be sport or high performance. □

Photos By Jerry Smith

Front exterior of the Odeum where the Expo was held.

Rose Goblisch, Chicago 1983 Expo Queen, to reign for two days.

CHICAGO 1983 EXPO

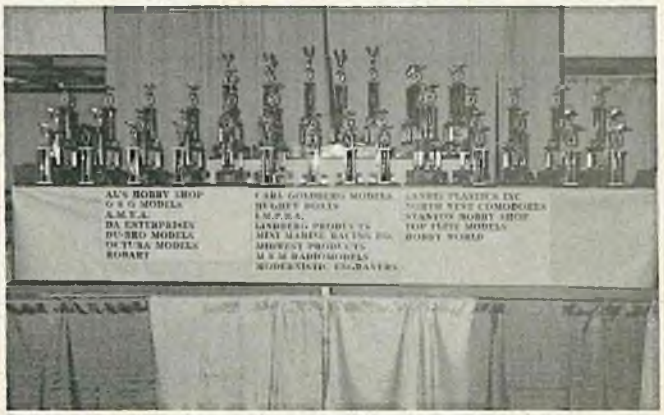
We attended the 11th Annual Greater Chicago Radio Controlled Model Show held on the weekend of October 15 and 16. The location was at the Odeum in Villa Park near the O'Hare International Airport.

There were several things that caught our attention. One was a nice size boat pond set up inside. There was good attendance every time a boat was put into the water. There was also an indoor car track that kept the car buffs fascinated. There were continuous flying demonstrations going on outdoors with the cooperation of the beautiful weather that prevailed all weekend. This weather resulted in a nice size crowd who viewed the various manufacturers, club displays and other organizations. There was also some outstanding models in all categories.

The Association of Greater Chicago Radio Control Clubs has to be commended on an outstanding job of putting together a very relaxed and friendly show. It made a most pleasurable experience for us and all those who attended. Make your plans now to attend next year's show. It will be well-worth it. □

Partial interior photo of crowd taken on Saturday.

The Swap Shop area which was located on second level was a busy place.



Trophies and those who contributed to the Expo.

NEW ERA .40

Designed by Lee Renaud
Text by Tim Renaud

This New Era .40, like its little predecessor will do anything you ask of it.

In June of 1975, RCM published the construction article for Don Dewey's New Era III. This .20 sized plane was considered a breakthrough design because it offered the performance of .60 size competition stunt aircraft in a smaller and more economical package. In the course of its two year development, each area of the New Era III's design and structure was carefully examined and refined to optimize the plane's performance. The end result had the unmistakable looks of a winner and the outstanding flight performance to back up the sharp appearance.

The New Era .40, as you may have already guessed, is a .40 size version of the New Era III. The design goals of the New Era .40 were the same as those of its smaller brother; provide a package with a strong, easy to build structure, head turning appearance, and spectacular performance. In addition, we felt that the New Era .40 should provide the modeler with a choice of a trike or taildragger configuration. With these ideas in mind, the design of the New Era III was enlarged, torn apart, and put back together again to come up with the New Era .40.

The first areas considered were the moments and areas of the New Era .40. The flight characteristics of the New Era III were reviewed and it was decided to go with the same general design with only minor changes. The tail moment was lengthened slightly to ensure that the .40 version would be smooth and consistent through maneuvers and to counteract any tendency towards nose heaviness if a 10 ounce tank were used. It was also decided that the side thrust in the smaller plane wouldn't be necessary so the engine was set at 0°-0°. Otherwise the design is a straight scale-up from the New Era III.

Once the plane's outlines were on paper, the new Era's structure was reevaluated. The D-tube wing has proven to be tough to beat in terms of strength and building ease so no changes were made there. For simplicity, the horizontal and vertical stabilizers remain sheet balsa with rounded edges. The fuselage uses full length air-ply sides for strength with doublers in the saddle area for added rigidity. The use of triangle stock in the corners and 3/8" balsa top and chin blocks allows the fuselage to be carved to a pleasing rounded shape and avoids that "slab-sided" look. On the whole, the New Era's structure has proven to be both quick building and lightweight, with finished and covered airframes (less engine and radio) weighing in at just two pounds.

After the initial prototype was completed, it was decided that one of the most important features of the New Era .40 would be to make it as versatile as possible. The first step in this direction was to build the taildragger version detailed on the plans. The changes to make this version of the airplane were kept to a bare minimum, and the result is a New Era with an entirely different look. With a choice of trike or conventional gear, the New Era .40 gives its builder the ability to personalize his airplane while, at the same time, retaining the same great flying characteristics. With tricycle gear you've got a sharp looking sport pattern model. Build a taildragger with wheel pants and you've got a plane that looks like it's ready for full scale aerobatic competition. Move the canopy back, add landing gear doors and invasion stripes and you've got a WW II fighter. In short, the New Era

.40 can be made into whatever you want. The best part is that once you've built it to look the way you want your airplane to look, it's going to fly the way you want your airplane to fly.

Flying is truly the best part about the New Era .40. It's not a beginner's first plane, but once a pilot has one shoulder wing trainer under his belt, the New Era should be no problem. The light wing loading and lift characteristics of the airfoil combine to give the New Era well-mannered and predictable slow flying capabilities, making landing approaches a breeze. All the controls are positive and fast. With a stock K & B .40, the New Era will do anything you ask of it. Loops track straight and true, snaps happen faster than you can count, and axial rolls require just a touch of elevator to string them all the way across the sky. The plans call out the control throws that we finally decided upon after testing the prototypes; with these settings you'll have a responsive airplane that is positive and quick but not twitchy.

Preparation:

Since the New Era .40 is not intended as a first model, the following construction notes outline the building sequence without detailing all the techniques used. Most of you building this plane will have developed your own favorite building techniques anyway, so if you don't like our approach, feel free to use your own. The airplane is not difficult to build; in fact, one of our prototype builders built his armed only with a set of parts and the rib spacing dimensions, with no plans or instructions at all!

It greatly speeds construction if you cut out all the necessary parts first and make your own kit. This avoids the frustration of being in the middle of a step and realizing you've got to go cut another part before you can complete the step. So control your urge to immediately start on the airframe for one or two evenings and get the parts finished first.

Wing:

The prototypes were built using a hinged plywood building board so that both panels could be built at the same time. There is 5/8" dihedral under each tip so your board or wing jig should be set up accordingly. If you don't have a hinged board or wing building jig, build one panel flat, then prop the tip up 1¼" and build the second panel onto the first.

(1) Check the aft edge of the 3/32" trailing edge sheet to be sure it is straight and trim with a straight-edge if necessary. Pin the sheet in position, butting the center joint tightly.

(2) Place scrap 1/4" jig blocks under the bottom spar and install the tip rib and the W-2 rib near the center. Use the rib notches to locate the spar and note that the back edges of the ribs are inset 1/4" from the rear edge of the sheeting.

(3) Install the rest of the ribs working from the tip inboard. Use the shear webs as spacers to align the ribs and hold them square to the spar. Cut out the W-1 ribs to clear the aileron servo before installing them. Trim the center webs to fit and finish installing the webs and W-1 ribs. Add the balsa filler blocks between the W-1 and first W-2 ribs.

NEW ERA .40

Designed By:
Lee Renaud
TYPE AIRCRAFT
Sport/Pattern
WINGSPAN
52 Inches
WING CHORD
10¾ Inch
TOTAL WING AREA
559 Sq. In.
WING LOCATION
Low Wing
AIRFOIL
NACA 2412 Mod.
WING PLANFORM
Constant Chord
DIHEDRAL EACH TIP
5/8 Inch
O.A. FUSELAGE LENGTH
45"
RADIO COMPARTMENT SIZE
(L) 9½" (W) 2¾" (H) 2½"
STABILIZER SPAN
21 Inches
STABILIZER CHORD (inc. elev.)
5⅞ Inch (Avg.)
STABILIZER AREA
123 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top Of Fuselage
VERTICAL FIN HEIGHT
6⅜ Inches
VERTICAL FIN WIDTH (inc. rud.)
5¾" (Avg.)
REC. ENGINE SIZE
.40 cu. in.
FUEL TANK SIZE
8 or 10 Oz.
LANDING GEAR
Tricycle or Conv.
REC. NO. CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev. Throt., Ail.
BASIC MATERIALS USED
Fuselage ..... Balsa, Spruce, Ply
Wing ..... Balsa, Spruce
Empennage ..... Balsa,
Wt. Ready To Fly ..... 64-72 Oz.
Wing Loading ..... 17-18.5 Oz./Sq. Ft.

(4) Check that all the shear webs are flush with the bottom edge of the rib notches. Install the top spar, making sure that it fits tightly against all the webs and that the bottom spar is resting on the 1/4" shims.

(5) Glue the 3/16" x 1/4" balsa T.E. in place. When dry, taper the top of the T.E. and the filler blocks to match the wing ribs. Use slow drying epoxy or CA to install the top trailing edge sheet.

(6) Glue the balsa leading edge in place against the front edge of the ribs. Use care to make sure the L.E. stays straight and even with the top and bottom edges of all the ribs.

(7) Install the top L.E. sheeting using either contact cement or CA. When finished, the wing can be removed from the building board.

We suggest you lay the wing aside for the moment and begin the fuselage construction. This will permit the installation of the 5/16" hold-down dowel before the bottom L.E. sheeting is completed.

Fuselage:

(1) Lay out and drill the necessary holes in F-1. The plans show the hole pattern for an Airtronics' mount; if using a different mount, relocate the holes as required. Epoxy the four 4-40 blind nuts to the aft face of F-1 and relieve the front face under the engine mount 1/16" to clear the steering arm boss. Make the pushrod cut-out in F-3 and trim F-2A as shown on the plans if you are using a 10 ounce tank.

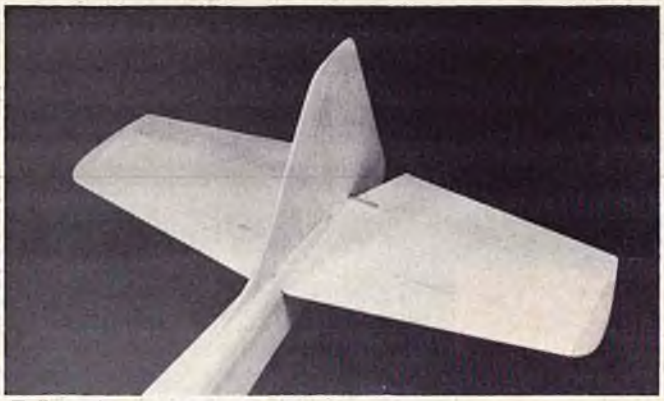
(2) Mark a centerline and the former locations on the 3/8" top block and pin it to the building board. Draw vertical centerlines on F-1, F-2A, and F-3, then glue them in place aligning the centerlines carefully and using a small square to ensure they are vertical.

(3) Glue the 3/8" triangle stock to the top block, making sure it is tight against the formers and inset 1/8" from the edge of the top block for its entire length.

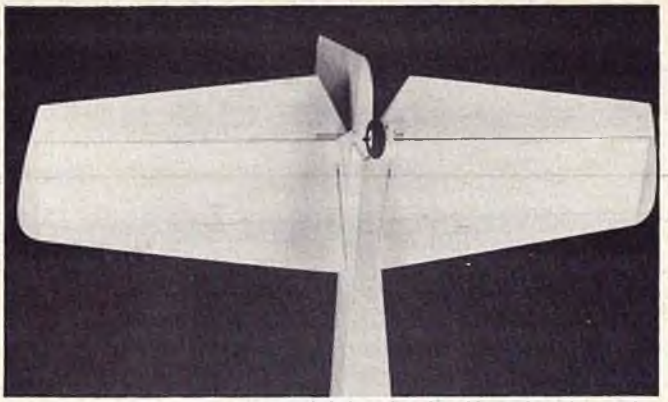
(4) Mark the former locations on the inside face of both 1/8" air-ply fuselage sides. **Making sure that you are making one right and one left side,** glue the 1/8" air-ply saddle doublers in place, checking the alignment carefully. Install the 5/16" x 1¼" T.E. stock tailpost on the left side **only,** then mark and cut out the pushrod exits for the rudder and elevator.

(5) Drop both sides in place around the former/top block assembly. Using the reference marks, carefully line up the sides with the formers. When satisfied with the alignment, glue the sides in place using masking tape and/or clamps to hold them together at the tailpost and tight against the formers.

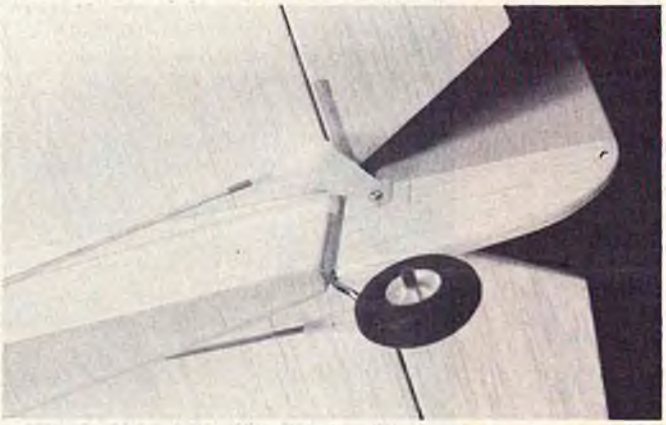
(6) Slide F-2B into the notches in the wing saddle doublers and glue in place. Cut and install the 1/8" x 1/4"



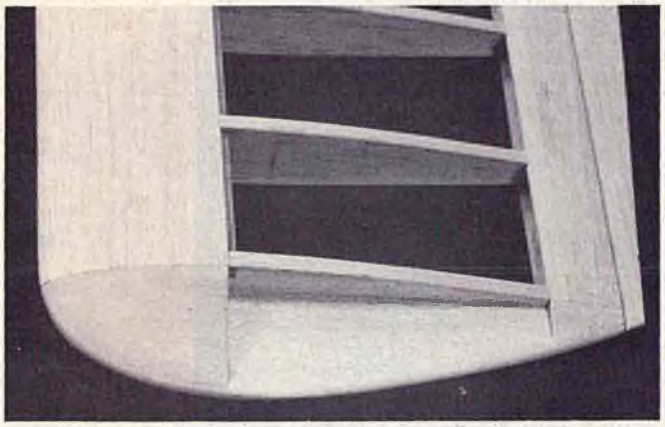
Tail surfaces pinned in place to check alignment prior to covering. Note how top block is shaped between fin and stab.



Solid sheet tail surfaces couldn't be simpler. Note that the grain on the stab tips run chordwise to resist warping.

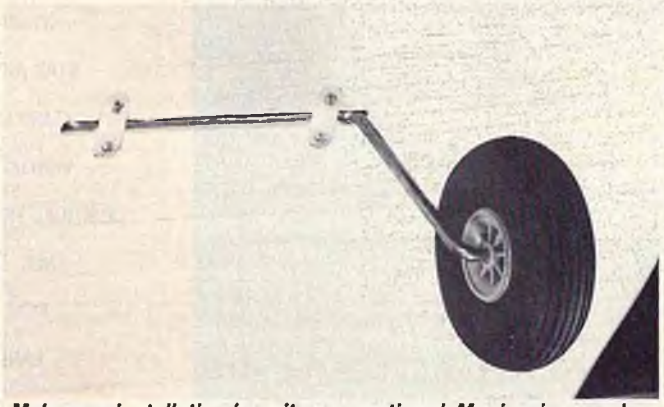


Detail of tail wheel installation. Aileron bearing is epoxied in fuselage. Tail wheel strut slips into ply horn mount. Simple and effective.

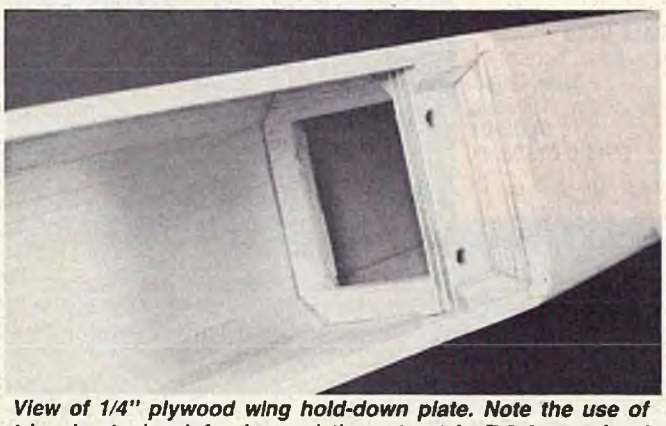


1/4" balsa wing tip with filler blocks. Top and bottom is easy to build and lighter than a solid block.

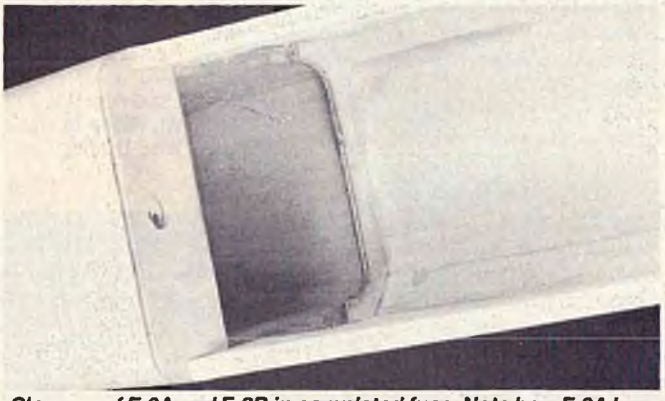
View of aileron bellcrank. Note that the pushrod from the servo goes in the second hole in, while the pushrod to the control horn goes in the outside hole.



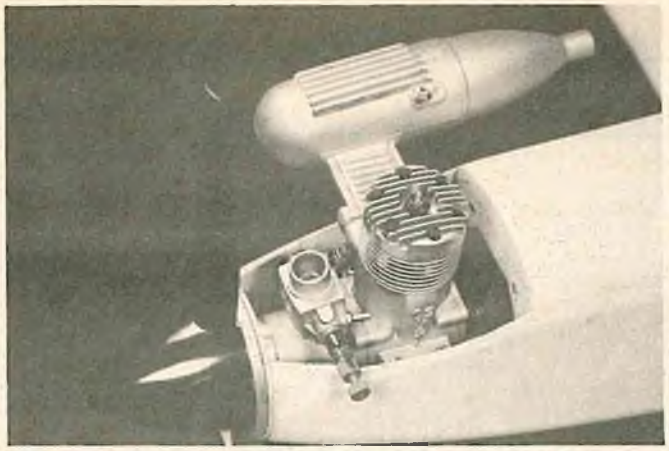
Main gear installation is quite conventional. Music wire gear leg fits into plywood trunnions and is retained by nylon straps and sheet metal screws.



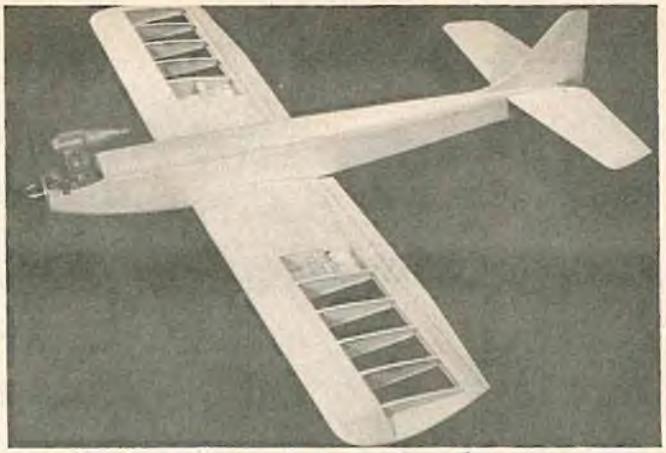
View of 1/4" plywood wing hold-down plate. Note the use of triangle stock reinforcing and the cut-out in F-3 for pushrod clearance.



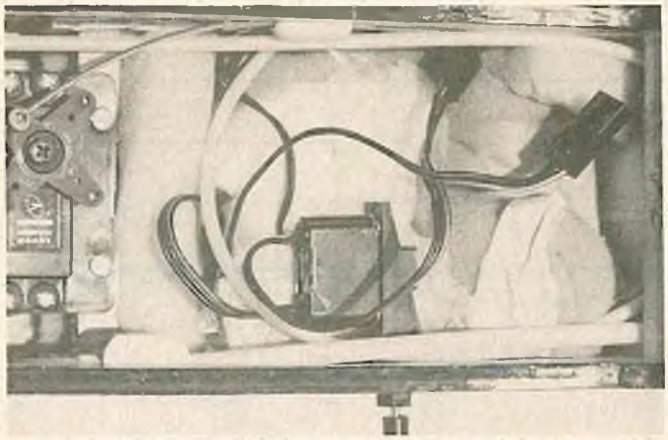
Close up of F-2A and F-2B in completed fuse. Note how F-2A has been cut out for 10 ounce tank.



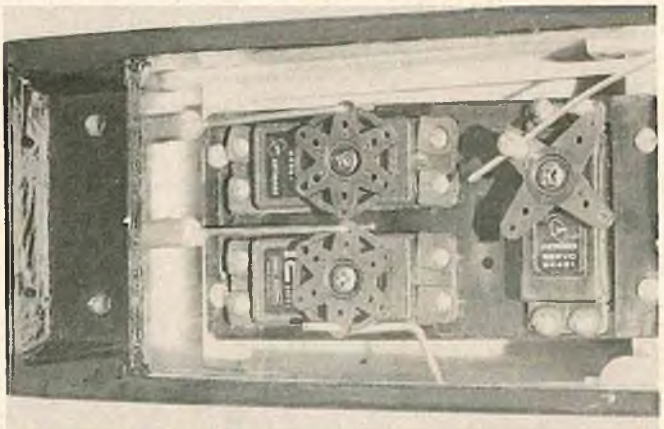
Close up of engine installation. Upright engine provides easy access to mounting screws and plumbing.



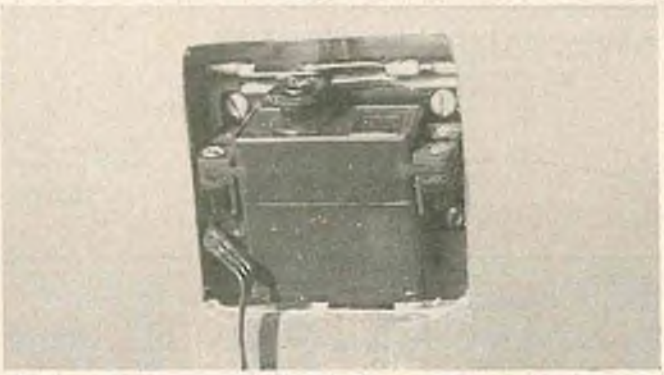
Completed airframe ready for final sanding and covering. Structure builds fast, light, and strong.



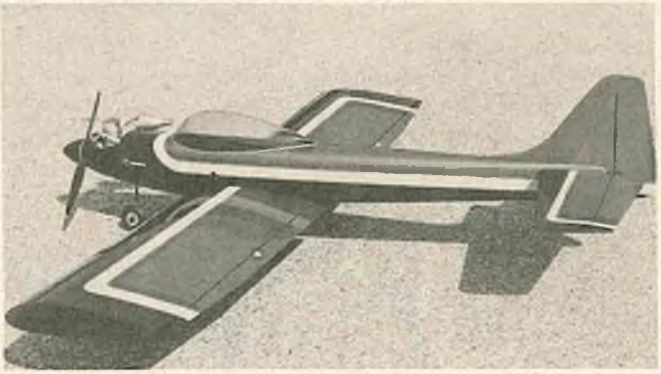
Receiver switch mounted in a Du-Bro switch mount. Makes a neat installation.



Servo installation in completed New Era .40. Note the use of cable for the throttle pushrod and wire for the nose gear pushrod.



Detail of aileron installation. Note the use of two metal clevises to drive ailerons.



spruce verticals that fit against the sides forward of F-2A and from the saddle doubler to the triangle stock. Add the second verticals that run from F-2A to F-2B.

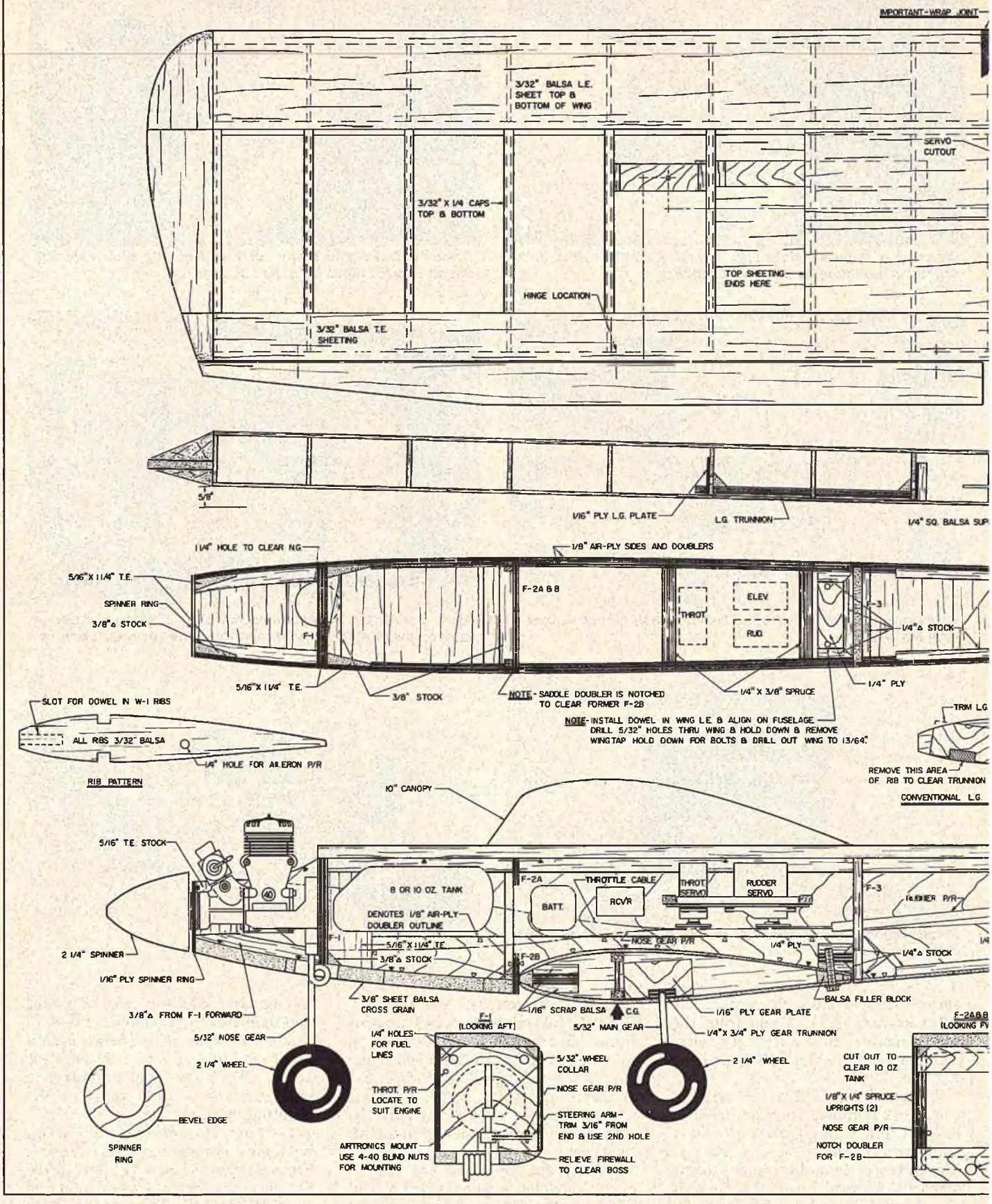
(7) Install the 5/16" x 1¼" trailing edge stock reinforcements behind F-1. Add the 3/8" triangle stock aft of F-1 and forward of F-2B. Epoxy the 1/4" plywood wing hold-down plate to the sides and forward face of F-3, then fit and install the 1/4" triangle stock pieces around the plate and behind F-3.

(8) Remove any pins inside the fuselage between F-3 and the tail. Glue the 1/4" triangle stock that runs from F-3 aft along the edge of the sides. Cut the aft bottom sheet from 3/32" stock and install, starting at F-3 and working toward the tailpost. Use a square as you go to make sure the sides don't bow in or out as you install the sheet.

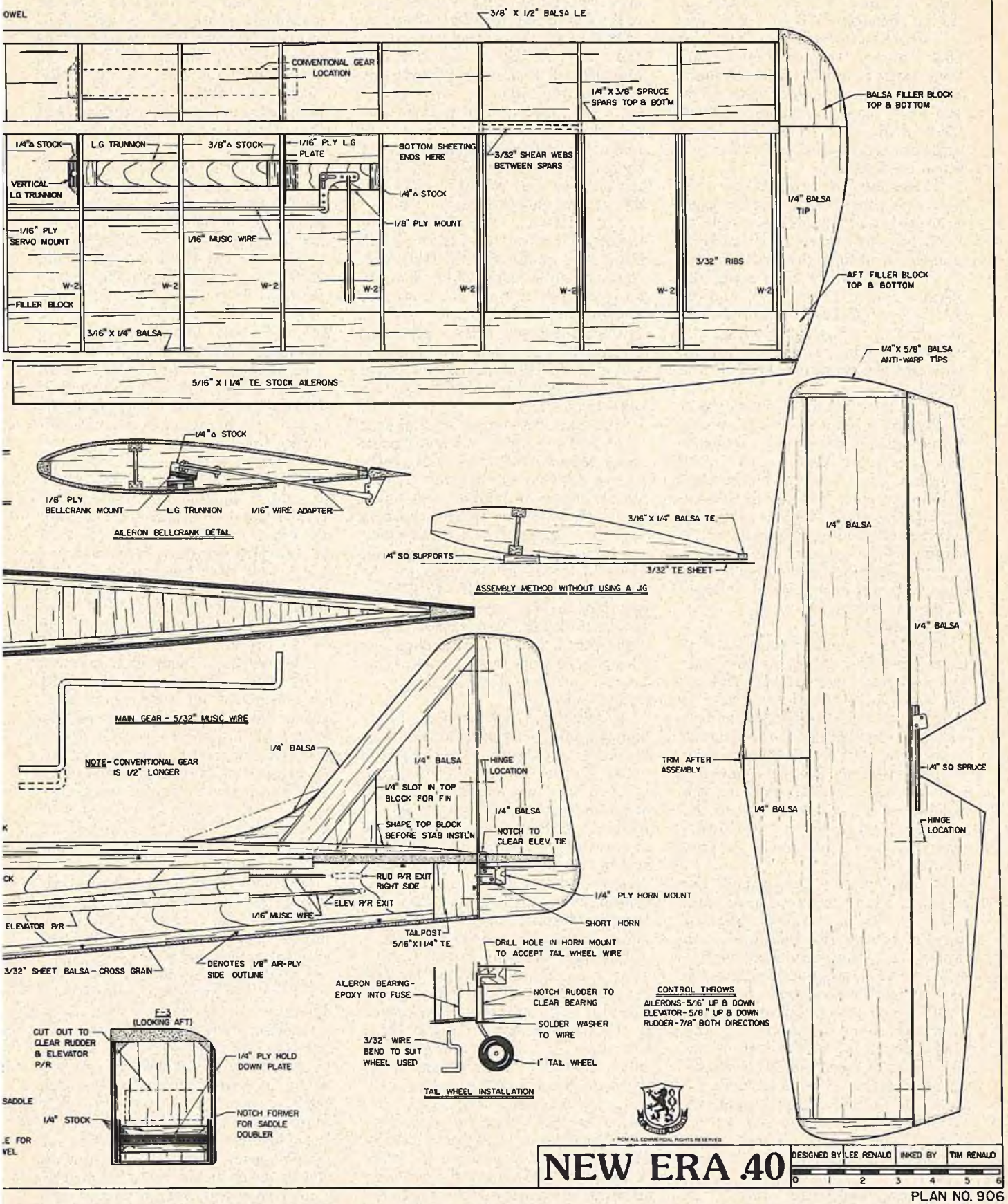
(9) Lay out and drill the engine mounting holes and nosegear holes in the engine mount. Temporarily install the mount on the firewall and install the nosegear strut and steering arm. Note that the arm needs to be trimmed to clear the side and raked forward approximately 5° to clear the firewall. Cut a 1¼" hole in the forward chin sheeting and drop over the nosegear strut. Check for proper clearance around the strut coils and glue the sheeting in place.

(10) At this point, the wing hold-down dowel should be installed. Sharpen the end of a piece of 5/16" O.D. brass tubing to act as a drill and check the fit through the hole in F-2B. Carve and sand the wing leading edge in the center where it fits against the

text to page 30


IMPORTANT-WRAP JOINT
3/32" BALSA L.E. SHEET TOP & BOTTOM OF WING
SERVO CUTOUT
3/32" X 1/4 CAPS TOP & BOTTOM
TOP SHEETING ENDS HERE
HINGE LOCATION
3/32" BALSA T.E. SHEETING
5/8"
1/16" PLY L.G. PLATE
L.G. TRUNNION
1/4" SQ. BALSA SUP
1 1/4" HOLE TO CLEAR N.G.
1/8" AIR-PLY SIDES AND DOUBLERS
5/16" X 1 1/4" T.E.
SPINNER RING
3/8"Δ STOCK
F-1
F-2A & B
THROT.
ELEV.
RUD.
F-3
1/4"Δ STOCK
5/16" X 1 1/4" T.E.
3/8" STOCK
NOTE- SADDLE DOUBLER IS NOTCHED TO CLEAR FORMER F-2B
1/4" X 3/8" SPRUCE
1/4" PLY
SLOT FOR DOWEL IN W-1 RIBS
ALL RIBS 3/32" BALSA
1/4" HOLE FOR AILERON P/R
RIB PATTERN
NOTE- INSTALL DOWEL IN WING L.E. & ALIGN ON FUSELAGE. DRILL 5/32" HOLES THRU WING & HOLD DOWN & REMOVE WINGTAP HOLD DOWN FOR BOLTS & DRILL OUT WING TO 13/64".
TRIM L.G.
REMOVE THIS AREA OF RIB TO CLEAR TRUNNION
CONVENTIONAL L.G.
10" CANOPY
5/16" T.E. STOCK
8 OR 10 OZ. TANK
F-2A
THROTTLE CABLE
THROT. SERVO
RUDDER SERVO
BATT.
RCVR
DENOTES 1/8" AIR-PLY DOUBLER OUTLINE
F-1
5/16" X 1 1/4" T.E.
3/8"Δ STOCK
F-2B
NOSE GEAR P/R
1/4" PLY
1/4"Δ STOCK
2 1/4" SPINNER
1/16" PLY SPINNER RING
3/8"Δ FROM F-1 FORWARD
3/8" SHEET BALSA CROSS GRAIN
1/16" SCRAP BALSA
C.G.
1/16" PLY GEAR PLATE
BALSA FILLER BLOCK
5/32" NOSE GEAR
2 1/4" WHEEL
F-1 (LOOKING AFT)
1/4" HOLES FOR FUEL LINES
THROT. P/R LOCATE TO SUIT ENGINE
AIRTRONICS MOUNT USE 4-40 BLIND NUTS FOR MOUNTING
5/32" WHEEL COLLAR
NOSE GEAR P/R
STEERING ARM- TRIM 3/16" FROM END & USE 2ND HOLE
RELIEVE FIREWALL TO CLEAR BOSS
5/32" MAIN GEAR
1/4"X 3/4" PLY GEAR TRUNNION
2 1/4" WHEEL
BEVEL EDGE
SPINNER RING
F-2A & B (LOOKING FW
CUT OUT TO CLEAR 10 OZ TANK
1/8"X 1/4" SPRUCE UPRIGHTS (2)
NOSE GEAR P/R
NOTCH DOUBLER FOR F-2B

FULL SIZE PLANS AVAILABLE — SEE PAGE 105



NEW ERA 40

DESIGNED BY	LEE RENAUD	INKED BY	TIM RENAUD

0 1 2 3 4 5 6

PLAN NO. 906

sides and position the wing on the fuselage. Hold the wing tightly in position with the center joint aligned with the hole in F-2B. Rotate the tubing through F-2B and the balsa L.E. Check that the hole lines up with the slots in the W-1 ribs and temporarily install the dowel. Add the 1/16" x 1/4" scrap balsa fillers above and below the dowel on the outboard faces of the ribs. Check alignment again and set the wing aside while you finish the fuselage.

(11) Mount the spinner on your engine and install it in the fuselage. Trim the sides so that there's a 3/32" to 1/8" gap between the spinner backplate and edge of the sides. Install the 1/16" ply nose ring using the spinner to align it properly. Add the 5/16" x 1¼" T.E. stock reinforcements and the 3/8" triangle stock along the bottom edge of the engine compartment. Remove the engine and mount.

(12) Mix a batch of Formula II Hobbypoxy or resin and coat the inside of the engine and tank compartments and the inside face of the chin sheeting. Glue the rest of the chin sheeting in place. This completes the construction of the fuselage except for carving and sanding. We prefer not to shape the fuselage until after the wing and tail surfaces are aligned as the square surfaces provide better alignment references.

Tail Surfaces:

(1) Fit the joints between the 1/4" balsa stab and stab L.E. pieces tightly and assemble the stabilizer. Add the 1/4" x 1/2" anti-warp tips and trim to shape when dry. Glue the 1/4" square spruce joiner to the elevators using the trailing edge of the stab for alignment. Bevel the leading edge of the elevator. Slot the stab and elevator for the hinges and install the hinges in the elevator. Temporarily slip the hinges into the stab and check for free elevator movement.

(2) Use a razor plane to taper the elevator. Plane only one face then block sand using the stabilizer as a handle. Round the tips and stab leading edge. Carefully sand the flat at the center of the leading edge where the stab passes through the fuselage.

(3) Assemble the fin pieces with the exception of the dorsal and all the rudder pieces. Bevel the L.E. of the rudder, make the cut-out to clear the elevator tie, then slot and temporarily hinge the fin and rudder. Taper the rudder in the same manner as the elevator and round all edges except the fin L.E. where it contacts the dorsal.

Completing The Wing:

(1) Install the 1/16" ply landing gear plates aligning them with the rear edge of the top spar and the lower surface of the ribs. Trim the balsa flush with the notches in the plates and trial fit the trunnion blocks. File or carve a chamfer on the inboard edge of the slot in the trunnion to clear the radius on gear legs prior to installing the trunnions. Epoxy the trunnions and the 3/8" triangle reinforcements into the wing, making sure that the bottom of the trunnion is flush with the ribs. Slip the gear in place and install the vertical trunnions so that the gear legs are perpendicular to the rib surface and aligned with each other when viewed from the tip.

(2) Drill the 1/8" holes in the bellcrank mounts, press in the #2-56 blind nuts, and install the bellcranks on the mounts. Make "Z" bends in the outboard ends of the 1/16" music wire aileron pushrods and insert them through the holes in the ribs. Insert the pushrod through the bellcrank and glue the bellcrank mount in the wing, then add the 1/4" triangle stock reinforcements.

(3) Install the bottom leading edge sheet and the center section bottom sheet. Run a 5/32" drill through the L.G. vertical block and bottom sheet to locate the inboard end of the landing gear slot. Make the slot for the gear legs and cut-outs for the gear retaining straps. Drill 1/16" diameter holes in the trunnion block for the gear retaining screws. It's a good idea to preinstall the self-tapping screws now so that if the screwdriver slips it won't punch holes in your covering. Slot the bottom sheet to clear the adapter link from the bellcrank to the control horn.

(4) Glue the 1/4" square balsa mounting plate supports to the lower center section sheeting and install the 1/16" ply aileron servo mounting plate. Locate and mount the aileron servo and hook up the pushrods. We have found that using two Du-Bro solder links (#999) modified by cutting the side of one link and hooked together with the remaining pin is the easiest hook-up method. Check the action of the pushrods and bellcranks now to be sure there is no binding.

(5) Install the top center sheeting after making the cut-out for the aileron servo. Trim the spars, sheeting, and leading edge flush with the tip ribs and install the 1/4" balsa wing tips. Add the forward and aft balsa tip blocks. Install all capstrips. Carve the tips, shape the leading edge, and sand the entire wing.

(6) Wrap the entire center section with fiberglass at least 3½" wide. We used K & B two ounce cloth and resin on the prototypes. Since there are no dihedral braces in the center joint, this wrap is essential for proper wing strength.

(7) Epoxy the L.E. dowel into the wing. When set, position the wing on the fuselage and make sure it is aligned in all planes. When satisfied, drill through the wing and fuselage hold-down plate with a 5/32" drill aligned perpendicular to the wing's lower surface. Remove the wing and tap the plate for the hold-down bolts. Use a 13/64" drill to enlarge the holes in the wing to clear the bolts. Reinstall the wing and make a final alignment check.

(8) Trim the tapered tip on the aileron and sand to the proper cross section. Bevel the L.E. of the aileron as shown on the plans. Mark the hinge and horn locations on the ailerons and wing, then cut the hinge slots and install the horns. Temporarily install the ailerons, make up the links from the bellcranks to the horns, then check the ailerons for free operation.

Completing The Fuselage:

(1) Before carving the top block, tack glue scrap 1/4" balsa spacers in the stab and fin slots to prevent the aft end of the block from cracking off during shaping.

(2) Draw a centerline on the top as a guide while shaping. Use a razor plane or knife to slab off the corners of the top block and sides, then start shaping the contour. Follow the cross section on the plan for the proper contour. Block sand until the edge of the 3/8" triangle stock is just visible. Taper the aft top surface starting at the forward end of the dorsal fin following the side view of the plans. Round these corners smoothly. Shape the aft bottom with a coarse sanding block since a knife will tend to gouge out the cross-grained sheet. Carve and sand the nose and chin area rounding the corners to fair smoothly with the nose ring and former F-2B. Cover the engine intake and exhaust parts and wrap the spinner with a couple of layers of masking tape. Temporarily install the engine and use the spinner as a guide for final shaping.

(3) Mount the wing on the fuselage temporarily and remove the spacers from the slots. Insert the stabilizer into its slot and sight from the front to check alignment with the wing. When satisfied, epoxy stabilizer in place, checking alignment in all planes very carefully. Slip the fin into the fuselage slot and seat firmly on top of stabilizer. Trim the lower surface of the dorsal fin to fit tightly against the top and glue to the fin. Remove from fuselage and shape dorsal top outline and sand contours into fin. Cut hinge slot in aft end of fuselage and glue fin and dorsal to fuselage and stab. Check alignment and be sure the fin is seated on the stab. Temporarily mount rudder and elevator horns and attach surfaces.

(4) Determine the location of your servos and install them on 1/4" x 3/8"

spruce rails. Make up and install all pushrods. Our prototypes used 1/4" dowel for the rudder and elevator pushrods, cable for the throttle pushrod and .062 diameter music wire running in 1/8" O.D. nylon tubing for the nosegear.

(5) Trim canopy base to roughly fit the fuselage. Wrap 120 sandpaper around fuselage and sand canopy for final contour. If you plan to add cockpit detail, make up the parts now and fit to the fuselage contour. A Williams Brothers 2" scale pilot is the right size for this aircraft. This completes the construction of your New Era .40. Go over the airframe again with fine sandpaper filling any dings or cracks with Dap or Hobbypoxy Stuff and you are ready to cover.

Conventional Gear Version:

The basic construction of the New Era .40 requires very few modifications to be changed into a taildragger configuration. The construction sequence is the same as the trike gear version with the following changes.

(1) Omit the N.G. pushrod hole in F-1 and the 1¼" clearance hole in the 3/8" chin sheet.

(2) Once the basic fuselage assembly is completed, slot the tailpost for the aileron bearing/tail wheel strut assembly. Note that the back edge of the fuselage has to be relieved slightly to place the centerline of the wire in line with the hinge line.

(3) Relieve the rudder to clear the aileron bearing and drill a 3/32" hole in the ply horn mount to accept the tail wheel wire. Note that this hole is located between the two rudder horn screws so that when the horn is installed it prevents the wire from splitting out of the ply.

(4) Temporarily install the tailwheel assembly and rudder and check to be sure the rudder is free of binding. Don't permanently install until after the fuselage is covered.

(5) Install the 1/16" ply landing gear plates ahead of the spar instead of behind it. Trim the forward upper corner flush with the top of the ribs. Finish installation of the trunnion blocks as outlined in the standard building instructions. When installing the vertical trunnion blocks, position them so the center of the wheel is 1⅛" back from the leading edge of the wing.

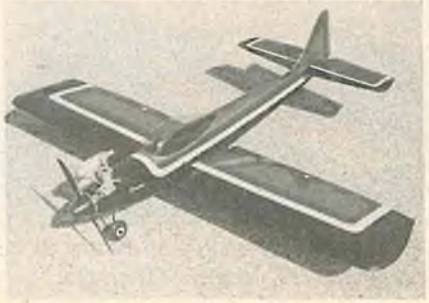
(6) After the bottom L.E. sheeting has been installed, locate the slot for the gear by measuring from the spar forward and then poking a pin through the sheet to find the slot. Trim the slot out and complete the wing the same as the trike version.

Covering And Finishing:

We suggest that you assemble the whole aircraft and give all surfaces a final alignment check before starting covering. It's a lot easier to correct any problems before finishing the model. Check the landing gear alignment, saddle fit, and wing and tail alignment once again and you will be confident of success on the first flight. The secret of performance of this size model is light weight. Resist the urge to pile on super finish with many coats of primer and paint. In our opinion the only way to finish your New Era .40 is with one of the plastic film coverings. Properly done, this will provide a beautiful finish with minor weight increase. The structure is very rigid and strong so any of the film coverings may be used. Cover the bottom of the wing first then add the aileron horn links. Check aileron operation and cover the top of the wing. If using MonoKote, covering the tips with a separate piece will make the job easier. The bottom rear fuselage is covered first, then a piece of material is applied to each side and wrapped around the top and seamed at the center. Complete the fuselage covering, then cover the tail surfaces and ailerons. Trim to suit.

Final Assembly:

Permanently install all control surfaces and control horns. Make up pushrod ends and attach to control surfaces. Install the tank and engine mount, all gear and wheels and connect the nosegear pushrod. Mount the engine and hook up the throttle linkage. Install the battery and receiver, using plenty of foam rubber around both. Mount the servos, make up the inboard pushrod ends and connect the servos to the surfaces. Check all control movements for the proper direction and amount of throw and freedom from binding. Make sure the balance point is on the spar. And you're all ready to take your New Era .40 flying! With its combination of looks and performance, we're sure the New Era will quickly become the favorite of your stable.



□

SOARING

Al Doig

Well, there goes another year. The older you get, the faster they go. I'm just now getting things sorted out after returning from the World Champs in York, England. No sooner arrived home than I came down with a world class sore throat. Turned out to be viral in nature, which means they don't know what to do for it, except wait. I couldn't wait for a $15 doctor's appointment so I took the one right away for $30. He looked down my throat, said "Hmmmm," and prescribed enough pain pills to supply the Spanish Inquisition. Oh well.

One thing I never got used to in England was the total absence of wash cloths in the bath. Whether it was a Hotel, Inn, Bed & Board, Motel, or whatever, there was never a wash cloth. I suppose one could take a cloth along, but when you are on the move, it never gets dry.

Another peculiar thing was an almost complete absence of English in London. The place seems to be almost totally populated by Arabs, German tourists and American tourists. The Arabs were riding around in chauffeur driven limos and the tourists were asking each other for directions.

There are more and more clubs holding cross country soaring events. The "Great Race" must have shown how much fun it could be. The latest I've received information on was one by the Michigan International Soaring Society, called Soar-Cross '83. Of the eight teams entered, six completed the 12.1 mile course at least once; the winner, Dennis Chall of the Brighton R/C Club, finishing in a time of 27:28. No data on the sailplanes was included although second place Mark Wencel appears to have flown a Sagitta XC.

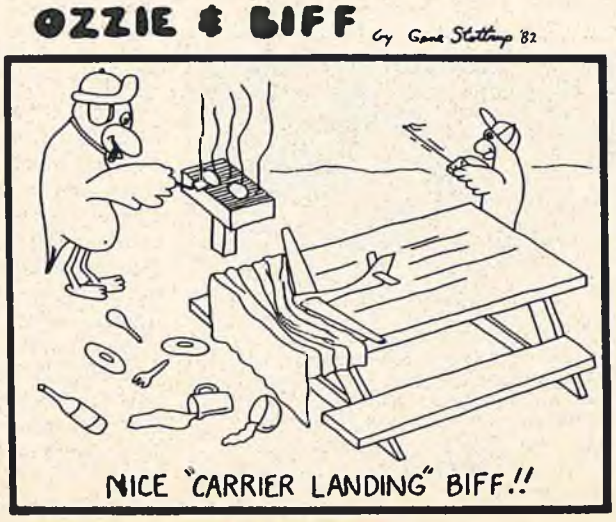
As an aside to clubs submitting data and pictures of their contests; I usually do not run contest data as it is mostly of interest to those who were there. Things that **do** interest readers are types of airplanes being flown in different areas and which ones win; which type of contest is popular; what classes are used to separate sailplane size and how many entries in each; is 2-meter **and** another class permitted? In other words, what was unusual, not who won by how many points. The weather is of interest only in relation to what sailplane types won, etc. An account of a contest written for submission to a national publication would be completely different from one written for a club magazine. Consider things that would interest **you** if you were reading about another contest in which you did not participate.

I've now attended two F3B World

First Place Team (L to R): Dick Ransom, Chuck Chall, Dennis Chall (pilot) and Ed Moore.

Second Place Team (L to R): Connie Martin, Will Martin, Dave Prokopp and Mark Wencel (pilot).

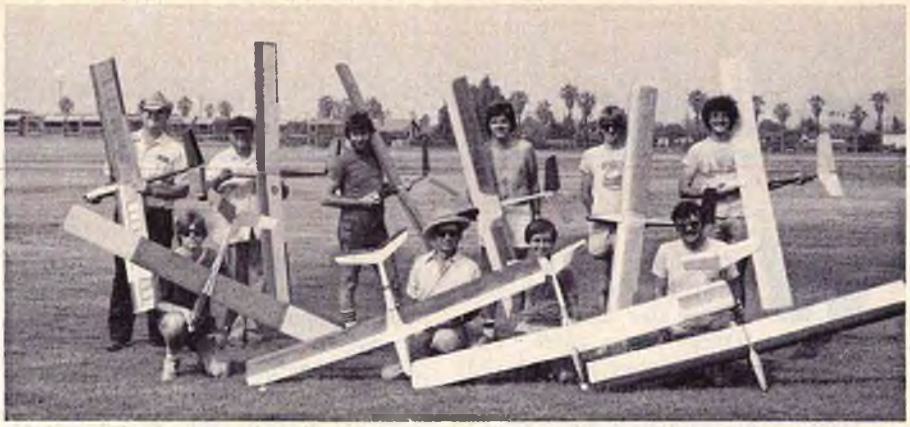
Third Place Team (L to R): Kelly Moeller, Dave Moeller, Ken Shaw, Ken Bates (pilot) Mrs. Hawk.



Sailplane Championships. This certainly does not qualify me as an expert in this event. It helps to be there as an observer, but to really appreciate the complexities of this event there's nothing like competing, which I did not do. However, for what it's worth, here are some thoughts. In looking forward to the 1985 team qualifications, if we want to go to Australia with a World Class team, we are already behind schedule.

I don't like to hold the West German Team up as being paragon, but until a better model comes along, I will. The German team was not without some problems. As the Team Manager said, "I've got one guy who thinks he would like to win; one guy who thinks he deserves to win; and one guy who thinks he **must** win." Although the team spirit may not have been absolutely cohesive, the result was near perfect with individual placings of first, second, and fourth, and a team ranking of first.

It was a bit shattering to find that the first contest to select the 1985 West German team was held two weeks before the 1983 World Champs. In Germany, a ranking lists the top 40 soaring pilots. This ranking is called the Bundesliga. The list is kept current with three invitational contests each year. The top three pilots on the list will represent West Germany at the World Champs. So, the German team has been qualified by at least six contests in the two years between World Champs. Also, as most soaring contests are F3B format, the Germans are tuning their machines and techniques on a weekly basis. The dedication to this event is as total as it can be, compatible with the requirement of earning enough money to support a family and an expensive hobby. There are two factors which enhance the development of F3B skills in West Germany. The first is the predominance of the F3B format at contests as opposed to the pure Duration events popular in the U.S.



On August 7th the Inland Soaring Society held a "one of a kind" contest featuring the Allure kit by Balsa USA. The Allure is a three function (rudder, elevator, aileron) 2-meter glider designed by John Lupperger (third from left, standing). It can also be built as a rudder/elevator model with a different dihedral brace supplied in the kit. Of the ten planes at the contest all but one used ailerons which are coupled with the rudders. The event was a twelve minute add-em-up with conventional 100 point spots. August 7th was one of the hottest and most humid days Riverside, California has had this year. Lift was sparse but everyone enjoyed the competition. To date the Allure has scored 1st and 3rd in the Sportsman Class, and three 1st, one 2nd, and one 3rd in the Open Class, and 1st in a club 2-meter contest based on the 2-Meter World Cup.

Second is the size of West Germany; it is slightly smaller than the State of Montana. From Hamburg to Munich, nearly the whole length of the country, is just over 400 miles, as the crow flies. This makes frequent national contests more practical than in the U.S.

The United States team qualification is a short series of regional qualifications, of questionable value, followed by a giant "King of the Mountain" tussle for four or five days after which the three survivors are crowned for the biggie, which is still a year away. At this point our three heros are like three skiers who, just having qualified for the Olympics, find they do not have real snow to practice on, and must confine their practice to grass covered slopes. There are just darn few F3B events in which to compete. Further, it takes a dedicated ground crew to even support practice sessions. One just doesn't go out and ding around the sky. It also takes a crew of skilled technicians to develop and refine the sailplanes. I think the day of the Dwight Holley charging in and winning with an all balsa airplane is past, unless the rules take an unforeseen bend.

So, what can the U.S. soaring community do about all these problems? One possibility is to say that the problem is too big to be solved by the very limited group of people interested in F3B competition. It costs quite a bundle of money to send a team to a World Champs, especially to the next one in Australia to which the air fare is around $2000 cada uno. Send six people and the AMA will spend 15 kilobux or so, with another like amount needed from donations, etc.

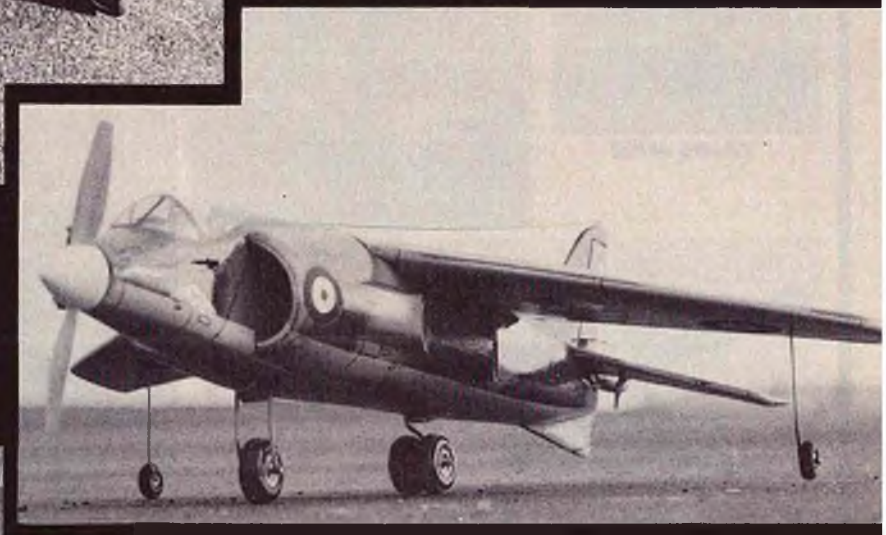
We can, of course, continue our present course and hope that synergism is alive and well. Or — loosely organized groups could be established in geographical areas where interest is centered; such as the Pacific Northwest, Southern California, Great Lakes Region, Northeast Florida, etc., etc. The purpose of these groups would be to provide a technical communication path among the interested individuals and either sponsor regular F3B contests or persuade host clubs to sponsor them, on a rotational basis. A logical National sponsor for such regional activities would be the National Soaring Society; though I make this suggestion with some feeling of reticence.

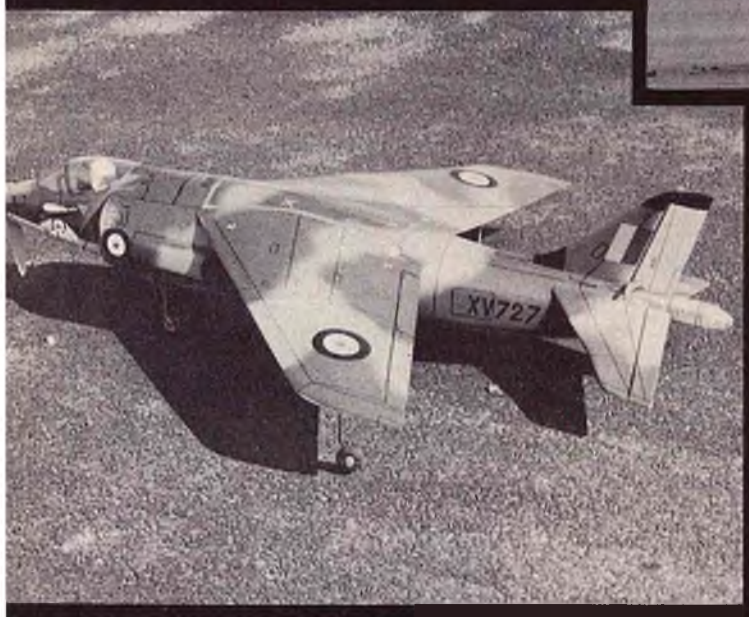
There certainly should be more than one "Run for the Roses." The results from a minimum of three National contests should be used to choose the team. I imagine some will say, "An active program of this magnitude would eliminate the average guy — he couldn't afford it." I would answer, "Of course." If you would ask the 1983 Team if they got a free ride to York, the answers might surprise you. It cost the participants a sizable sum just for the minimal program. Some are still wondering how they are going to pay. I would estimate that participation in a viable selection program would cost $5,000 to $10,000 and occupy 80% of the time not used to make a living. If you're going to enter the America Cup Yacht Race, you can't do it with just a dinghy and a lot of luck.

Anyway — as I said, time is running out; there's only 18 months left until the 1985 opening ceremonies.

Next month — no soap box; catch you then, all being well. Howzat! □

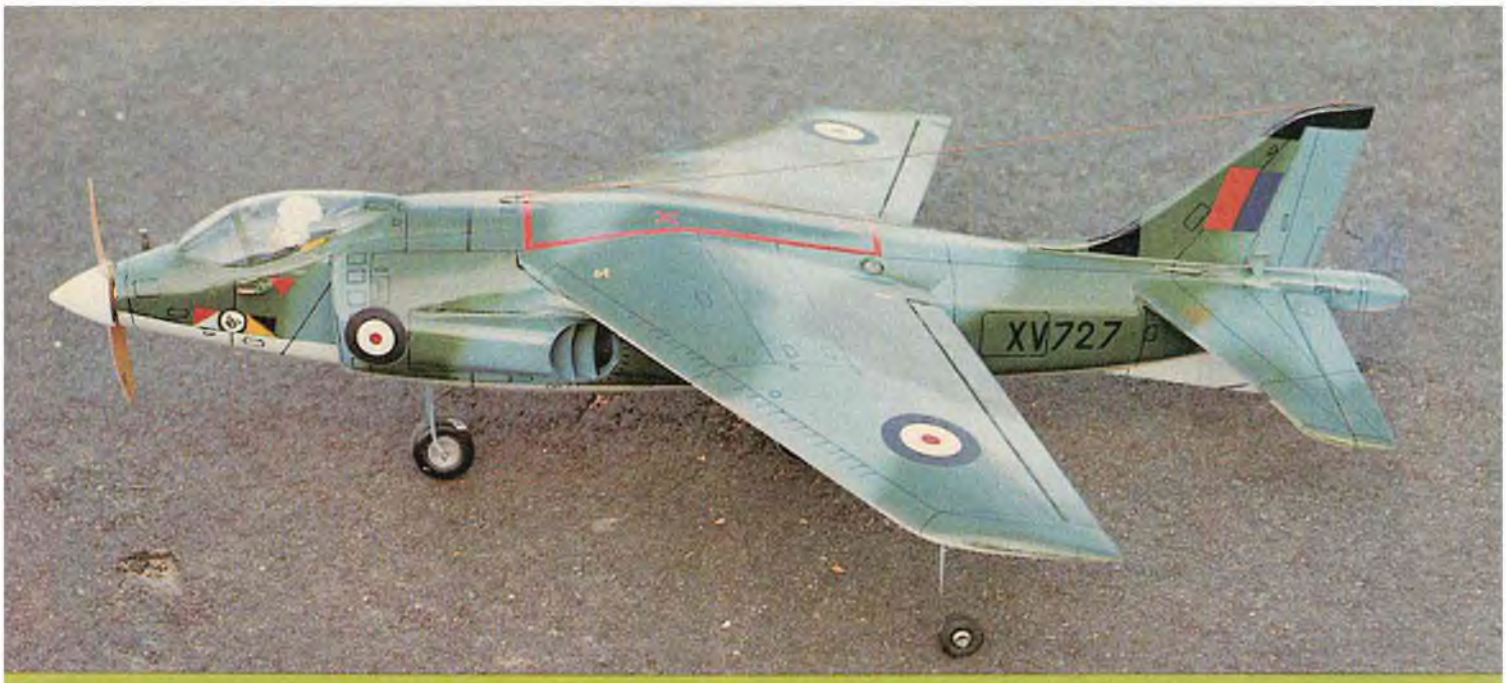
A superb .40 powered sport scale model of the (V/S.T.O.L.) jet fighter.





B. Ae. HARRIER

By Pavel Bosak



Thirteen years of service is a long time to wait for your moment of glory; but such was the case for the now celebrated Hawker Siddeley Harrier, the world's first operational Vertical/Short Take Off and Landing (V/S.T.O.L.) jet fighter.

Perched atop the decks of the Royal Navy assault carriers HMS Hermes and HMS Invincible, under the leaden skies of the freezing and windswept South Atlantic, Sea Harriers prepared for the inevitable struggle with Argentine forces that would determine the fate of the disputed Falkland Islands.

Dressed in a stark finish of low-visibilty grey matching their dismal surroundings, Harriers met the enemy: Argentine Air Force fighters, warships, and ground targets. The Harrier drew "first blood" in the Falklands in the late evening hours of May 8, 1980, when two Argentine Air Force Mirage fighters were downed. This victory was followed the same evening with the downing of a Canberra bomber by another Harrier of the Invincible's 801 Squadron. In one peculiar incident, two Harriers managed to down four Argentine Mirages with just three Sidewinder missiles!

The stage was set for victory and when aggressions ceased in mid-June, almost 105 Argentine aircraft and helicopters had been destroyed, nearly two-thirds of which were credited to Harriers. The Harrier had proven its worth as a weapon of modern warfare.

The Harrier is not an aircraft to sit long polishing its medals; for poised off the coast of war-torn Lebanon are a group of U.S. Navy carriers. Their decks are laden with several U.S. Marine AV-8A Harriers ready to strike should the multi-national peace keeping force entrenched in Beirut fall under attack. Let's pray, however, for the Harrier's continued peace time operation.

The model presented here captures all the unique lines and distinctive character of the Harrier without the complexities of using a ducted fan unit or attempting to make it super scale. Shooting for an exciting looking but practical sport scale model, I enlarged the wing and tail, reduced the anhedral, and made some minor outline changes all aimed at simplifying construction and aiding flyability. I don't think the result suffers much from these changes, so here it is for the model building public to judge.

CONSTRUCTION

Wing:

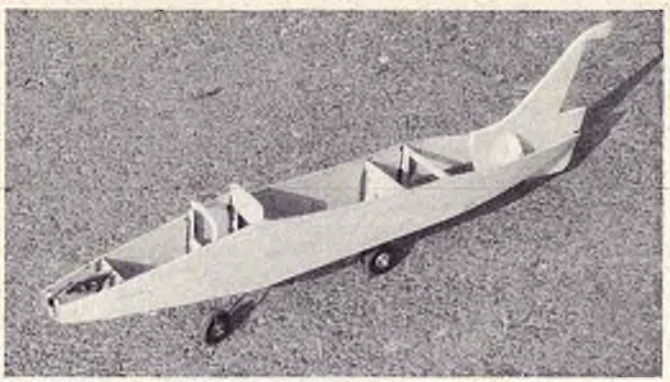
Begin with the wing which needs to be complete to aid in the construction of the fuselage. The wing is of conventional all balsa construction and should present no difficulties for any modeler.

First, cut out all the 1/8" sheet wing ribs W-1 through W-7 and the 3/16" sheet main spars.

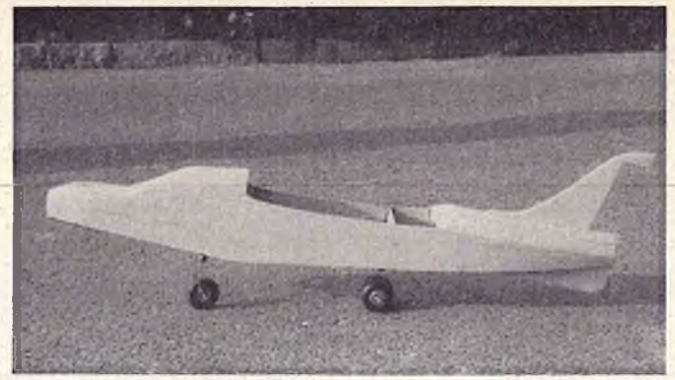
The angled slots in the ribs and spars are easily made by cutting slightly undersized slots and sanding

B. Ae. HARRIER

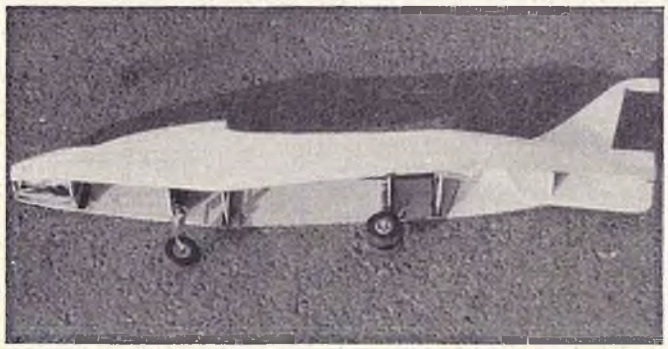
Designed By
Pavel Bosak
TYPE AIRCRAFT
Sport Scale
WINGSPAN
36¼ Inches
WING CHORD
Root 13⅜"
Tip 5½"
TOTAL WING AREA
350 Sq. In.
WING LOCATION
High Wing
AIRFOIL
Eppler 2010 G
WING PLANFORM
Swept Double Taper
ANHEDRAL EACH TIP
2⅜"
O.A. FUSELAGE LENGTH
45½"
RADIO COMPARTMENT SIZE
(L) 10" X (W) 4" X (H) 3"
STABILIZER SPAN
17¼ Inches
STABILIZER CHORD (incl. elev.)
5" (Avg.)
STABILIZER AREA
72 Sq. In.
STAB. AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
6 Inches
VERTICAL FIN WIDTH (incl. rud.)
6" (Avg.)
REC. ENGINE SIZE
.40 cu. in.
FUEL TANK SIZE
8 Oz.
LANDING GEAR
Tandem w/out Riggers
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Ail., Throt.
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa & Ply
Wing ..... Balsa, & Ply, Hardwood
Empennage ..... Balsa
Wt. Ready To Fly ..... 100 Oz.
Wing Loading ..... 41 Oz./Sq. Ft.



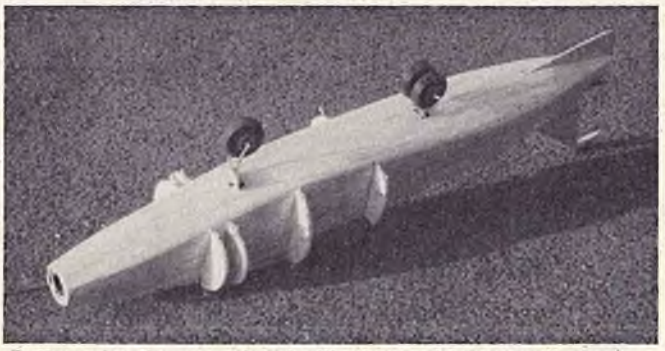
Basic box construction is first step.



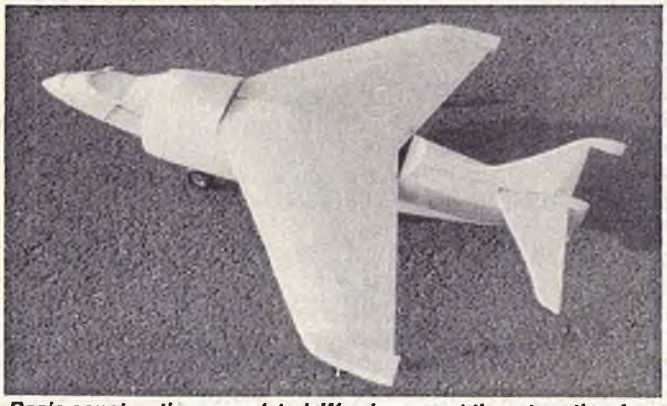
Top of box is completed with sheeting.



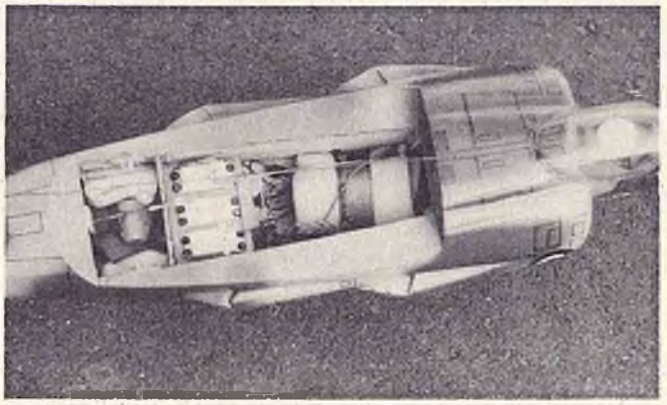
Bottom view before sheeting is installed.



Bottom sheeting completed with side pod formers attached.



Basic construction completed. We always put them together for early bench flying.



Wing removed for easy access to radio gear.

the bevels in with tools consisting of scraps of 1/8" and 3/16" balsa sheet to both sides of which 220 grit sandpaper strips are glued. Be sure to reverse the slot angles on one set so you don't make two sets of ribs and spars for the same side. Carefully bevel the front and rear of each rib, again making right and left hand ribs.

Pin the main spars down over the plans and start adding ribs. Check rib alignment carefully before positioning the 3/16" x 1/2" sub-L.E. and 3/16" x 1/4" T.E. strips. Scrap balsa shims may be used to raise the sub-L.E. and T.E. above the work surface. Sight along the structure to insure uniform shim height as you don't want to build in any warps.

Install the channeled L.G. blocks between ribs W-5 and W-6 then start making the 1/8" sheet wing skins. Give these ample drying time.

While waiting, prepare the wing for its anhedral by first beveling the root of the sub-L.E. and main spar to match the anhedral angle. Place the wing flat against the table upside down and glue the panels together after raising W-7 with a 4¾" shim. Glue in brace WB-1 and reinforce the main spar joint with 6 oz. fiberglass cloth and epoxy resin. Drill 3/8" holes in the center of the L.E. and main spar, then glue in the 3/8" hardwood wing mount dowel.

The sub-L.E. and T.E. strips must be beveled now to accept the wing sheeting. Sheet the bottom first. Note that each of the four wing skins must have a shallow beveled arc cut at the root to mate properly at the wing's center. This is important as there is no center rib for support.

Glue the 1/8" sheet cap ribs onto the center of the bottom skin T.E. which also must be beveled to mate with the upper wing skin. The 3/4" square wing bolt filler blocks and the aileron torque rod assemblies may be added now. The wing is ready for the top sheeting.

Following a quick sanding with a long block, glue on the 1/2" x 3/4" L.E. strips. The 3/8" sheet ailerons may be tacked onto the T.E. with several dabs of Ambroid or similar cement. Glue on the wing tip blocks and the wing is ready for final shaping and sanding.

Remove the ailerons with acetone and a razor blade, then bevel them accordingly prior to hinging with small Du-Bro nylon hinges.

The aileron servo mounting box is made of 1/8" sheet sized to fit your particular servo and set into the bottom center of the wing.

All that remains are the outrigger L.G. struts which are bent from 1/8"

music wire and mounted with small metal straps and sheet metal screws.

Fuselage/Tail Surfaces:

Obviously, the fuselage will be the most time consuming part of this project and some techniques, such as planking, will require more advanced skills than did the wing. Study the plans and photos carefully to familiarize yourself with the construction process.

The best way to begin is by making yourself a "kit" of all the major parts. There are a lot of bulkheads and formers in this model, so take some time to identify each part after it is made.

Before actually assembling the fuselage, have the bulkheads drilled to accept the pushrods, fuel lines, and mounting hardware you intend to use. Also, you might want to make a cut out in F-3 for access to the nosewheel mounting bracket set screw. It is very difficult to do these things after the fuselage is assembled.

Bend both landing gear struts out of 5/32" music wire and silver solder the rear L.G. axle. Bolt these to F-2 and F-4.

Modify and drill the engine mounting plate to suit your engine and epoxy securely four 6-32 blind mounting nuts. Glue the engine mount to F-1 and coat this assembly with epoxy or fuel proof resin.

Now is the time to make the fin since it is built into the fuselage. Sheet the basic structure with 3/32" vertical grained balsa and mark the F-6 location on both sides.

Prepare the fuselage sides by laminating the 1/32" ply doublers with contact cement. Note that the doublers extend from the nose ring to just aft of F-5. Mark bulkhead locations on both fuselage sides and vertical centerlines on each bulkhead.

Now that the tedious preliminaries are out of the way, construction can begin. A simple jig is most helpful for building the fuselage straight and true. There are a few marketed and several "home-builts" described in magazines. If you don't use a jig, beware of twisting the fuselage.

Glue the formers to the sides using the top view and centerline as alignment guides. The centerline is your lifeline here, so keep the bulkheads aligned and you should have no problems. Fit the fin between F-6 and the fuselage sides using a large carpenter's square to check vertical alignment. When dry, plank the fuselage bottom with soft, straight grained strips of 3/16" x 3/8" balsa.

Fit the pushrods for rudder, elevator, and throttle; then mount the fuel tank. Be sure everything is correct with this installation and that there are no leaks, plugged lines, etc. For those desiring tank access, an optional hatch may be cut in the bottom planking between F-1 and F-2.

Using the canopy top view as a guide, cut the windshield floor out of 1/8" sheet. Position this atop F-1 followed by the canopy floor F-7. Glue a small scrap of 1/8" balsa vertically between the top rear of F-7 and F-2 to hold F-7 in position during planking.

Glue on F-5A beveled to mate properly with the top planking. Now plank the fuselage top.

Carve a hole in the nose to suit your engine, then give the main fuselage a thorough sanding.

The enormous air intakes and side mounted jet exhausts are among the Harrier's most characteristic features. Begin these by marking the positions of the intake formers FC-1 through FC-4 on the fuselage sides, then glue the formers in place. Plank both intakes.

Trim the planking ahead of FC-1 and glue on the 3/8" sheet nacelle rings. The planking must also be trimmed to conform to the wing seat.

Mount the 1/2" square hardwood wing mounting blocks. Let dry, then test fit the wing. Trim the planking as necessary. Now install the 1/32" plywood wing seats covering them with Saran Wrap before mounting the wing to prevent glue from sticking. When dry, remove the wing and lightly sand the seats.

The exhaust nozzles aren't as complicated as they look and their basis are four holes cut in the corresponding positions on each fuselage side. Cut formers F-8 and F-9 out of 1/32" ply, bend into approximations of the exhaust rings and glue them into the holes followed by exhaust louvers F-10 and F-11. The nozzle fairings are cut from 1/2" sheet and glued to the fuselage sides, then carved to shape.

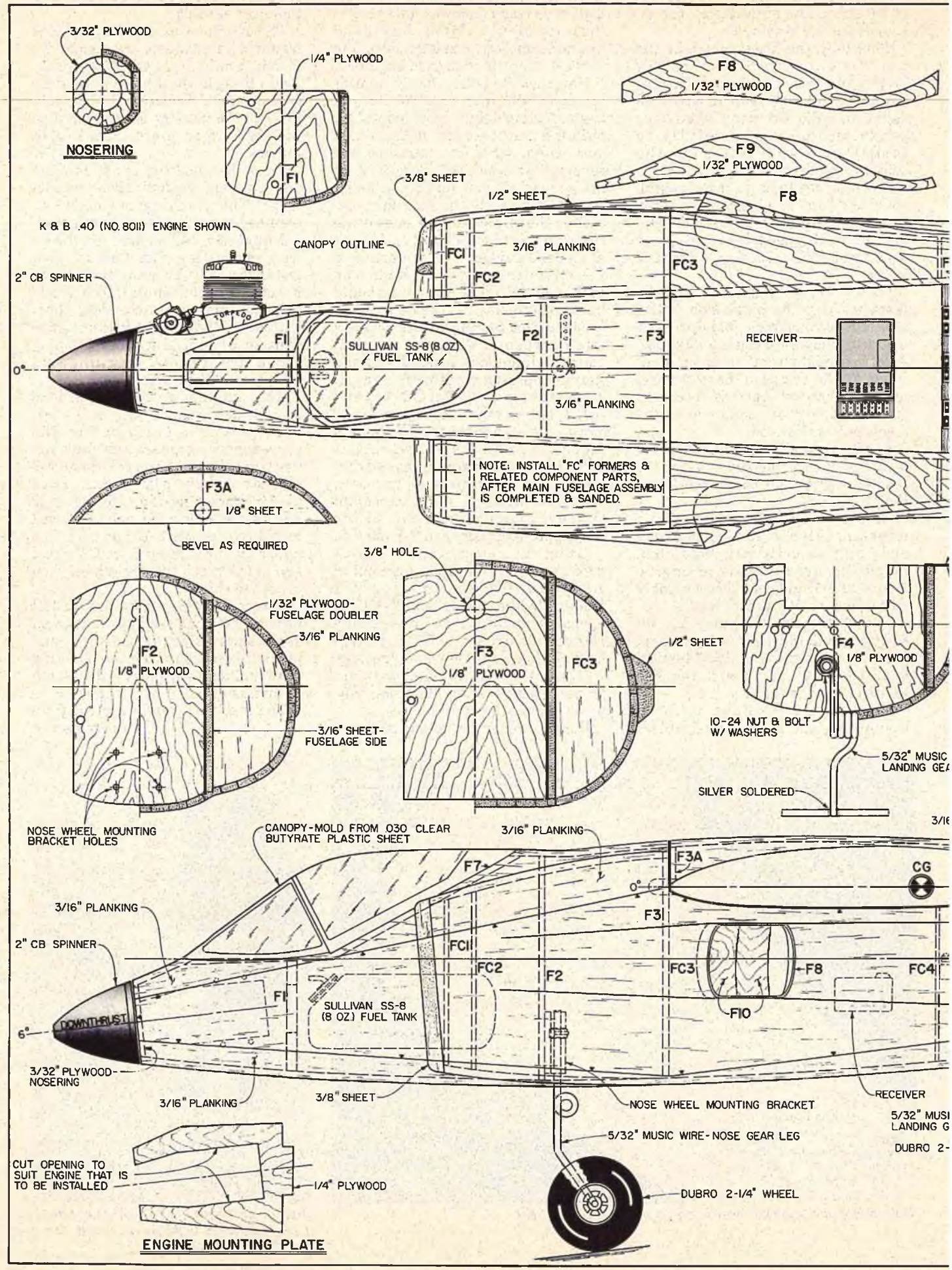
Mount the wing again and install formers F-3A and F-5B beveling them as necessary. Remove the wing, and plank this section. Trim the planking front and rear to achieve a tight wing to fuselage fit.

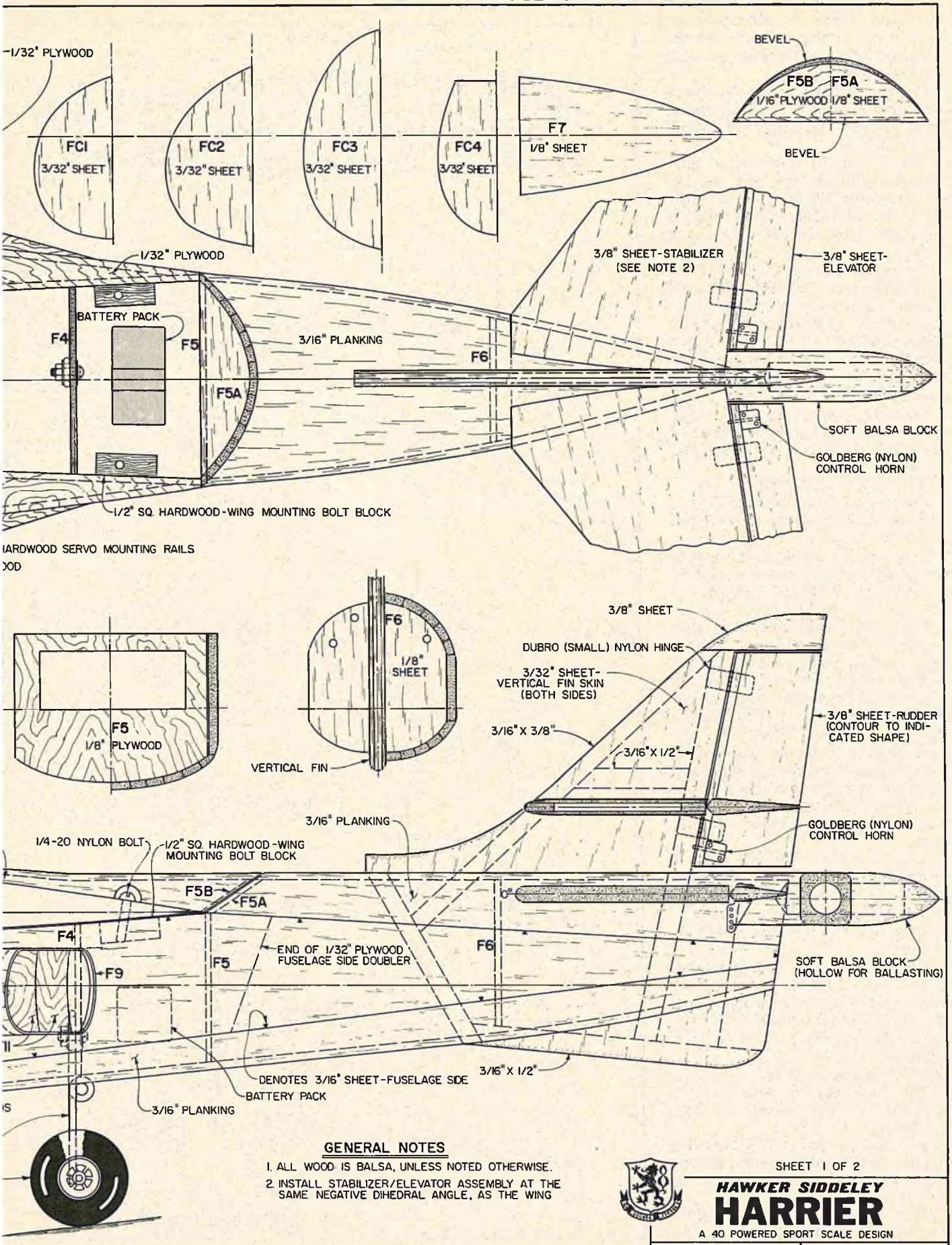
The stabilizer halves are cut from

text to page 42

Bottom of wing showing aileron servo and outrigger wheel.

Designer Pavel Bosak of Zahradni, Czechoslovakia, with the Harrier. It does get cold in the winter.


3/32" PLYWOOD
NOSERING
1/4" PLYWOOD
F1
F8
1/32" PLYWOOD
F9
1/32" PLYWOOD
F8
3/8" SHEET
1/2" SHEET
K & B .40 (NO. 8011) ENGINE SHOWN
CANOPY OUTLINE
FC1
3/16" PLANKING
FC2
FC3
2" CB SPINNER
F1
SULLIVAN SS-8 (8 OZ.) FUEL TANK
F2
F3
RECEIVER
0°
3/16" PLANKING
NOTE: INSTALL "FC" FORMERS & RELATED COMPONENT PARTS, AFTER MAIN FUSELAGE ASSEMBLY IS COMPLETED & SANDED.
F3A
1/8" SHEET
BEVEL AS REQUIRED
3/8" HOLE
1/32" PLYWOOD-FUSELAGE DOUBLER
3/16" PLANKING
F2
1/8" PLYWOOD
3/16" SHEET-FUSELAGE SIDE
F3
1/8" PLYWOOD
FC3
1/2" SHEET
F4
1/8" PLYWOOD
10-24 NUT & BOLT W/ WASHERS
5/32" MUSIC LANDING GEA
SILVER SOLDERED
3/16
NOSE WHEEL MOUNTING BRACKET HOLES
CANOPY-MOLD FROM .030 CLEAR BUTYRATE PLASTIC SHEET
3/16" PLANKING
F7
F3A
CG
0°
3/16" PLANKING
F3
2" CB SPINNER
FC1
FC2
F2
FC3
F8
FC4
F1
SULLIVAN SS-8 (8 OZ.) FUEL TANK
F10
6°
DOWNTHRUST
3/32" PLYWOOD-NOSERING
3/16" PLANKING
3/8" SHEET
NOSE WHEEL MOUNTING BRACKET
RECEIVER
5/32" MUSI LANDING G
5/32" MUSIC WIRE-NOSE GEAR LEG
DUBRO 2-
CUT OPENING TO SUIT ENGINE THAT IS TO BE INSTALLED
1/4" PLYWOOD
DUBRO 2-1/4" WHEEL
ENGINE MOUNTING PLATE



GENERAL NOTES

1. ALL WOOD IS BALSA, UNLESS NOTED OTHERWISE.
2. INSTALL STABILIZER/ELEVATOR ASSEMBLY AT THE SAME NEGATIVE DIHEDRAL ANGLE, AS THE WING

SHEET 1 OF 2

HAWKER SIDDELEY HARRIER

A 40 POWERED SPORT SCALE DESIGN

DESIGNED & DRAWN BY
PAVEL BOSAK

PLANS BY
Bob Wallace

0 1 2 3 4 5 6

PLAN NO. 907 ②

3/8" sheet, shaped and sanded before mounting. Mark and cut the mounting slots in the fuselage then install the stabilizer halves at the same anhedral angle as the wing.

Cut the rudder and elevators from 3/8" sheet, sand to a symmetrical taper section, and hinge with small Du-Bro hinges.

The Harrier's distinctive long tailcone houses the rear passive warning radar (PWR) antenna. On the model, however, it is simply a carved soft balsa block hollowed to accept ballast.

My canopy was heat molded in the household oven from .030 butyrate plastic sheet using a carved balsa form. This technique has been well-described previously and one outfit offers a vacuum forming unit just for such applications. Of course, a commercially available canopy can be trimmed to fit, or a carved balsa unit substituted. I improved the cockpit by fitting an instrument panel, pilot, and ejector seat top.

Covering and Finishing:

The ultimate appearance of your model depends greatly on the time you spend at this stage.

Fine sand the whole model noting any unsightly gaps, nicks, or dips in the planking. Fill these imperfections with putty and sand again.

When you are satisfied with the quality of the airframe, give it three coats of clear dope, sanding lightly between coats. Cover with lightweight Silkspan paper applied damp. Damp Silkspan handles beautifully over sheeted surfaces. The Silkspan covering saves countless applications of sanding sealer and primers that add weight and always seem to leave some grain showing. Seal the covering with six to eight coats of dope thinned 50-50.

Aerogloss colors were used for the camouflage paint scheme and the panel lines were done in India ink with a ruling pen. All markings are decals sealed with a coat of Aerogloss fuel proofer.

Squadron/Signal Publications offers a fine book on the Harrier showing a variety of color/markings schemes and other details, including Royal Navy colors used in the Falklands.

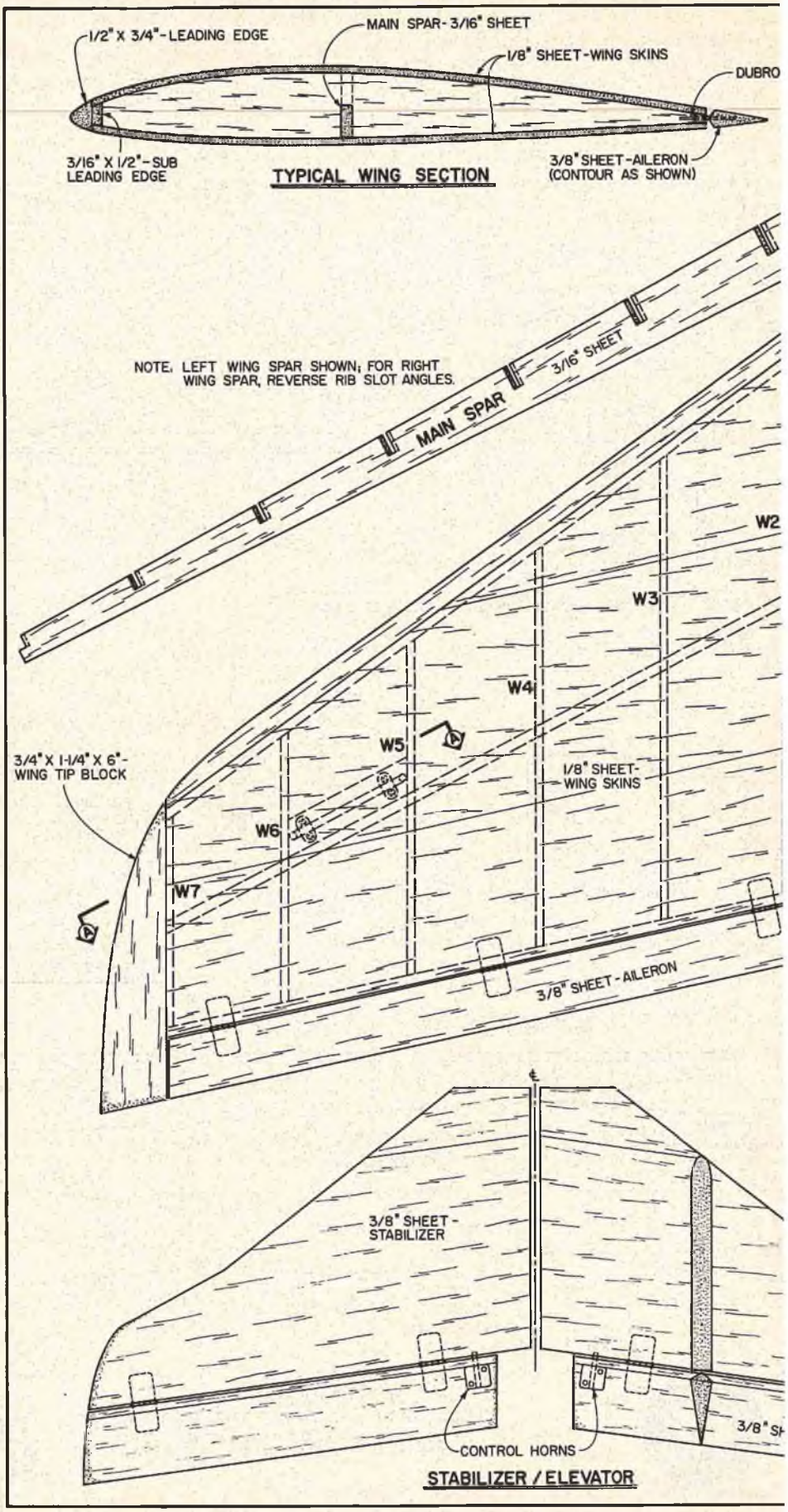
Completing the Model:

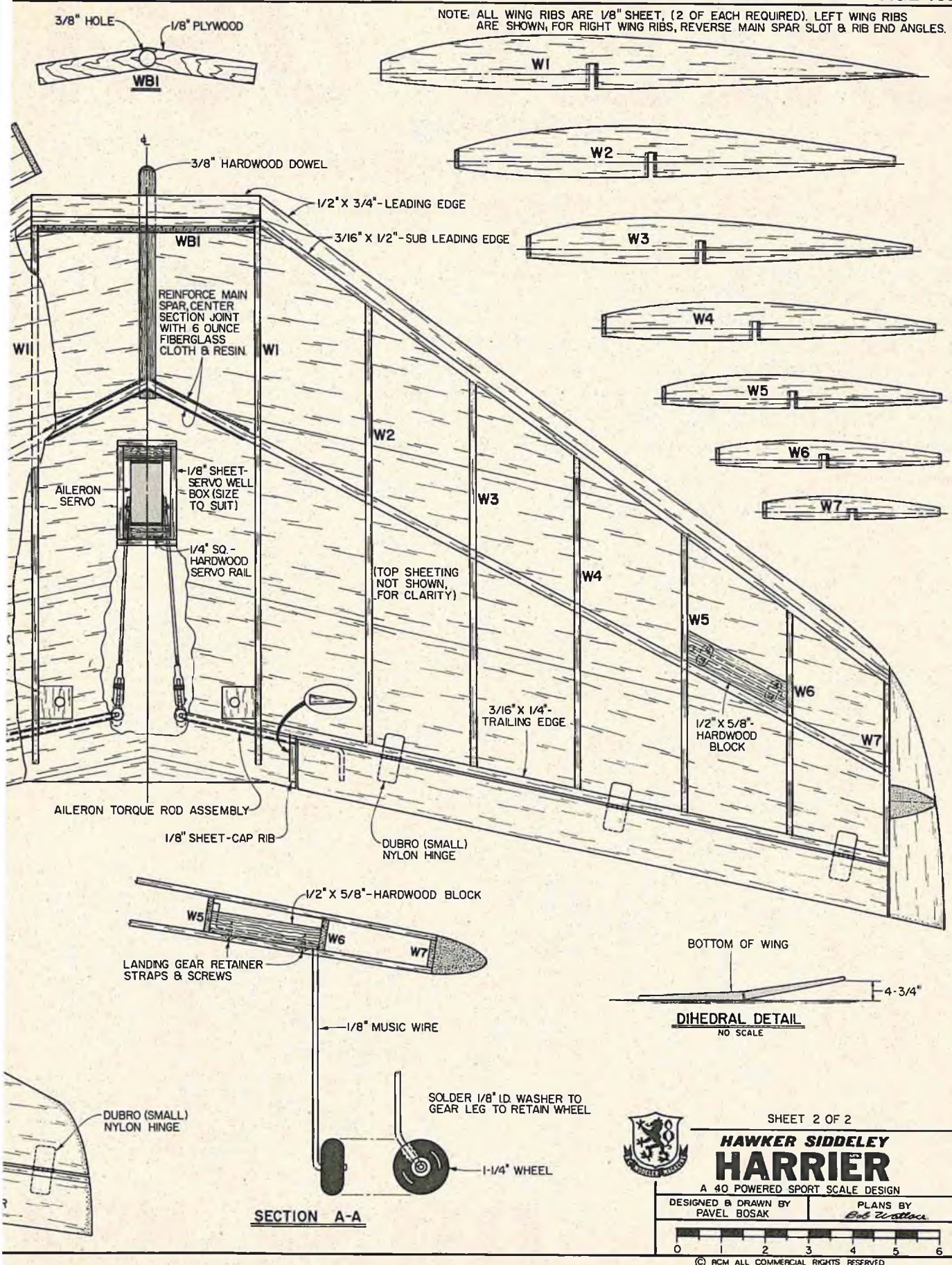
The final stages consists of mounting the engine, wheels, and R/C equipment.

The prototype used an O.S. Max .40 with muffler. The plans show a K & B .40 installed, but any good strong .40 will suffice.

There's plenty of room for R/C equipment in the Harrier's fuselage. Mount the servos on hardwood rails as

to page 203





SHEET 2 OF 2

HAWKER SIDDELEY HARRIER

A 40 POWERED SPORT SCALE DESIGN

DESIGNED & DRAWN BY PAVEL BOSAK

PLANS BY Bob Wallace

0 1 2 3 4 5 6

PLAN NO. 907 ②

SUNDAY FLIER

Ken Willard

The 1983 RCM Slope Soaring Trophy Races

Slope racing. One of the most exciting, exasperating, frustrating, demanding, destructive and satisfying combination of luck and skill that you can find in our sport of radio controlled aircraft competition. And the RCM Annual Trophy Races represent the absolute pinnacle in slope racing. This year's contest was a classic example of all that can happen in slope racing. Let's go through all those adjectives and see why.

Exciting. Since the races were originally held, back in 1967, designs have been refined to the point where the difference in speed capability between the fastest airplane and the slowest is only about two miles per hour, so piloting skill becomes the dominant factor; a racer doing forty five miles per hour loses ground to one doing forty seven, then turns inside the leader and regains the lead at the pylon. Many of the races this year had all four planes rounding the final turn simultaneously, with the one that made the best turn winding up the winner.

Exasperating. The races were originally scheduled for April. Contestants arrived from Seattle, Salt Lake City, Los Angeles and San Diego, only to sit around for two days waiting for the rain to stop first, and then for the wind to blow on the second day. No luck, and the races had to be postponed. Exasperating.

TROPHY RACE WINNERS

1. Jerry Arana
2. Rich Spicer
3. Angel Sanchez-Figueras
4. Lewis Clark
5. Ron Vann

Frustrating. The wind comes up; you check the wind meter, and load your ballast accordingly. The race starts, the wind drops, and your racer lands on the beach, while a slower, but lighter loaded job finishes the course. He wins, and you get a DNF (did not finish) which almost ruins your chances of placing. Alternatively, you have droppable ballast, and ballast for the wind. The race starts, and the wind drops. Aha! Gotcha, guys. You drop your ballast, as they start to sink. Suddenly, the wind comes back up, stronger than before. You've lost your ballast, and they come back strong. Damn!

Demanding. Slope racing is one racing event where the same power is available to every contestant. You can't tweek the needle valve, shave the prop, increase the nitro, or shim the head. The wind is there; how you use it is one of the most demanding skills there is. All you can do is use it. You can't change it.

Destructive. Unfortunately, the course that has to be flown at a coastal site requires turning out to sea and into the wind at both ends of the course. This results in a figure eight racing pattern --- somewhat similar to the pattern which is used in automobile "destruction derbies." Midair collisions are almost a common occurrence. Yes, you could fly further out, and avoid the crowd, but you would also lose the lift advantage. So you take your chances.

Satisfying. Yes, in spite of all the problems, slope racing is one of the most satisfying events there is. Especially if you win, of course. But even when you lose, you've had the thrill of competition, and the little inner feeling that "Gee, if I hadn't bobbled that last turn, I'd have won," or "I didn't really lose; that midair just knocked me out. I'll get him next year." And everybody else --- except the winner --- feels the same way. It's sort of a feeling that's hard to describe --- "I didn't win, but I didn't lose, either."

As you can easily tell, I love slope racing. And the South Bay Soaring Society, which has staged the races for several years, does a truly outstanding job when it comes to putting the races together. It's not an easy job --- no event is, for that matter --- and it takes a lot of dedicated manpower to handle the myriad of

details involved. George Paige, contest director, and Bob De Mattei, contest manager, assembled a great crew --- too numerous to mention here --- and during the two days of racing, six rounds, each with eight heats, plus four flyoffs, resulted in fifty two races. Actually there were fifty three, because one of the heats had all four planes ending up on the beach and had to be restaged.

Previous reports of the RCM Trophy Races in past years have described the course, the starting procedure, and the finish, so I won't repeat it. Let's get to the photos. They'll give you some of the flavor.

Photo Number One shows Jerry Arana, the winner, with his original design, "T-Bird." Actually, Jerry came to the races planning to fly his new "Grand Boss," only to have it damaged beyond field repair by a midair collision in his very first race. Fortunately, for Jerry, more than four rounds were flown, and when that happens, your worst round is thrown out. So, Jerry went to his backup, and won the remaining five races in which he participated. He was the only one to do so, thus making him the overall winner. He also won the fastest time trophy.

Photo Number Two shows Rich Spicer with the "Best Design" award --- as determined by a vote of the contestants.

Photo Number Three shows Angel Sanchez Figeura delicately guiding his disabled racer to a landing. He has had a midair collision, and the wing of his racer was fluttering perilously close to breaking. However, rather than land immediately, Angel carefully and gently continued to finish the race, thus avoiding a DNF. His skill saved the ship so it could be repaired and flown again. How well? Well, this is Angel's first slope race --- and he won third place!

Photo Number Four shows Carl Chulick with perhaps the most unusual racer in the contest, even though it did not win the design award. So what is unusual about it? Take a look at Photo Number Five.

High voltage? For what? Ionization of the wing surface, that's what. And why? To keep the air flow away from the wing surface, theoretically reducing drag and making the plane fly faster. There's a nine KV supply, constant charge. It takes three or four seconds to build up the charge on the wing. The chrome mylar covering acts as a charge shield on the outside. As for the effectiveness, the results so far have been inconclusive. But you have to give Carl credit for trying something new.

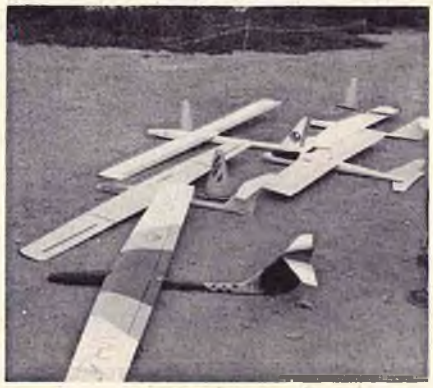
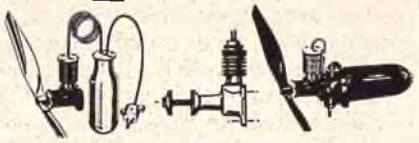


Photo Number Six shows the ready area with five typical racers --- sleek, similar, yet different in detail. The racers in this year's RCM event were the best yet --- and so were the pilots.

Bud McCrary was given a complete sailplane radio and all, in appreciation for letting the SBSS use his coastal air strip for the races. Bud is a full scale power pilot, glider pilot, hang glider pilot, and R/C pilot. Great guy!

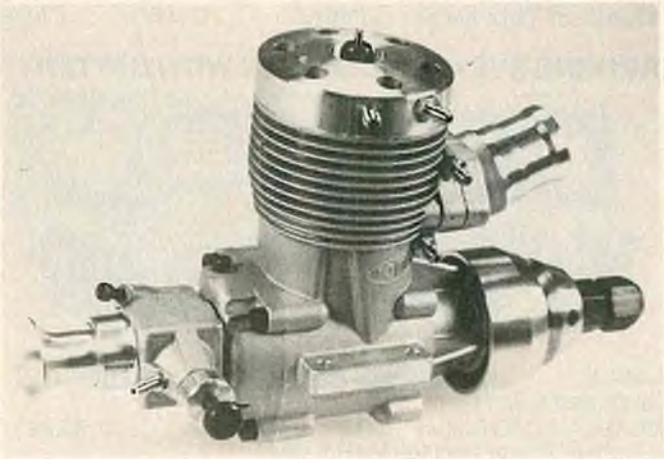
Great weather, great racing. Too bad you couldn't be there. And how did the old Chief Sunday Flier do? Well, next month I give out the Dum-Dum award for 1983. I'm not eligible, or I would have won easily. The Dum-Dum award --- not the races. Tell you about it next month. Hint. Most racers do a victory roll when they win. 'J'ever hear of a victory "Split S" into the side of a hill?

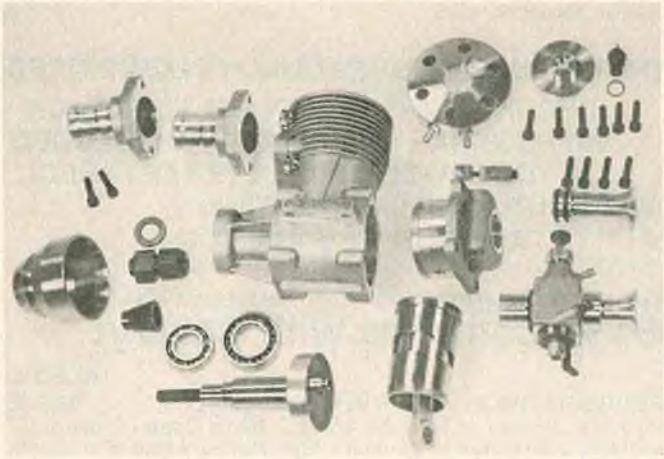
Stay tuned. □



ENGINE CLINIC

Clarence Lee





At the time of this writing (late Sept.) the long awaited K & B 11cc (.67) marine engine has finally been shipped to distributors and hobby outlets. This is certainly good news for the model boaters who have been waiting for this new engine's release but naturally a bit disappointing for the model aircraft fliers who have also been waiting for the new K & B Schnuerle port 10cc (.61) aircraft engine. However, if all goes according to projected plans, the aircraft version of the new engine should be released about the time this article appears in print or shortly after.

The new K & B 11cc marine engine has actually been under development for approximately eight years in one form or another — both in aircraft and marine versions. It was seven or eight years ago that I was flying one of the first prototype aircraft engines. However, many changes have been made in the design to bring it to its present development. Fellows are naturally wondering why it has taken so long to produce the engine. This has been due to many factors. Initially it was a matter of pricing. John Brodbeck of K & B did not want to release just another .61 on the hobby market in competition with the foreign imports. To build the engine he actually wanted to build, it would have to be an expensive engine. Price-wise the K & B would not have been competitive with the foreign imports. However, during the past few years monetary values have become more favorable to the U.S. That is, prices of the foreign engines have been increasing to a point where the U.S. engine manufacturers can again be financially competitive.

K & B also knew that in order to build the new engine the way that they wanted would require some new and expensive machinery. They did not want the engine to be as good as the Rossi, OPS, etc., but better. As most fellows probably know by now, K & B has been owned by Leisure Dynamics for many years and they actually had control of the purse strings. More recently John Brodbeck Sr. and Jr. have acquired K & B back from Leisure Dynamics and are now sole owners. Since they are once again in charge of the purse strings one of their first moves was to buy two new CNC (Computer Numerical Control) machines. These new CNC machines are capable of holding closer tolerances and better finishes than any equipment used in the past by model engine manufacturers. In fact, many grinding and honing operations of the past can now be eliminated due to the close tolerance work that can be performed on the CNC machines. More on that later in the column.

A large percentage of K & B's engine business is in the marine field. The fact that John Brodbeck Sr. is an active model boater as well as many of K & B's employees — Bobby Tom who heads Customer Service, Jack Garcia, etc., probably played a part in making the decision to market the marine engine prior to the aircraft engine. Model boating rules here in the U.S. allow a top displacement of 11cc (.67 cu. in.) for Class C boats; hence the reason for the .67 displacement size engine. The aircraft version of the engine will have reduced bore and stroke to comply with the AMA and FAI 10cc (.61 cu. in.) maximum displacement limits for two stroke aircraft engines. Whereas the 11cc marine engine is of rear rotor intake design, the 10cc aircraft engine will be of front rotor intake design.

Although the basic engine design was finalized some time ago, there was still one decision to be made that held up production for almost a year ... whether to make the engine a long stroke/smaller bore or shorter stroke/larger bore engine. Prototypes of both types were built and it was found that the longer stroke engine favored the Deep "V" and Monoplane type hulls due to the prop running deeper in the water and the shorter stroke engine favored the Hydroplane type models due to the prop running on top of the water. Many port and timing combinations in conjunction with the bore/stroke ratios were tried before coming up with the final configuration that would satisfy both type of boat hulls. All of this testing was performed personally by Johnny Brodbeck Jr. and hundreds of hours were involved trying different prop sizes, pitch, etc. Along with the prototype engines that have been in use the past few years, the new K & B 11cc engine has to be one of the most tested and proven engines (prior to production) of all time.

There are several methods of producing a model engine crankcase casting. The most common is by the pressure die cast method. However, pressure die casting often has limitations when it comes to producing internal port and passage

to page 63

angles. With pressure die casting, an internal "core" with the shape of the inside of the engine has to be able to be removed. Not being able to shape the inside of the engine to their satisfaction by using pressure die castings, K & B chose to use what is known as the Investment Casting (Lost Wax) method. This is the most expensive and time consuming method of making a casting but assures that the most intricate internal shape can be duplicated. This is due to the fact that each crankcase requires an individual "core" that is destroyed upon its removal. The aerospace, jewelry, dental, and many other industries use the Investment Casting process to make intricate parts to very exacting tolerances. I realize that most of you do not fully understand the processes behind Pressure Die Casting, Investment Casting, Sand Casting, etc., but that is not the point of this article. Perhaps in some later column I will go into more detail about these different casting processes.

So much for some of the history behind K & B's new 11cc marine engine. Let's take a look at the engine itself.

The engine has a bore of .960" and stroke of .920" for a displacement of .6659 or 11cc. The crankcase, as mentioned previously, is produced by the Investment Casting process and given a "glass bead blast" finish. As can be seen in the accompanying photographs, the crankcase is of extremely robust construction with very heavy wall thickness in all critical areas to assure that the crankcase does not bend or distort under the high operating loads imposed by model boating use. K & B chose to go with a one piece case/front plate unit rather than the removable front plate type of construction to increase the rigidity of the crankcase. A feature not seen before on a production model boat engine to my knowledge is water cooling of the exhaust port area of the case. This is generally done to the bolt on "water cooled" throttle, or pipe adapter. By cooling the hottest part of the case directly, distortion of the crankcase bore and sleeve is reduced dramatically. You can note in the accompanying photographs the high finish obtained by the new CNC machines. To obtain this degree of finish, a single point diamond cutting tool is used and the machine operated at an extremely high rpm — 4,000-5,000 which is incredibly high speed for any type of metal cutting machinery. Another nice addition is the use of threaded steel inserts for the pipe adapter screws. Due to the high heat generated in this area, the pipe or exhaust adapter screws are often easily stripped. This is due to heat actually softening the aluminum or fusing the aluminum to the screw. With the steel inserts, this problem is eliminated.

The engine is of ABC design meaning a high silicon aluminum piston runs in a chrome plated brass sleeve or liner. Here is a place where the new CNC machines improve quality and eliminate some pevious machining steps. When fitting a piston/sleeve assembly it is standard procedure to centerless grind the piston to a close tolerance dimension and then hone the sleeve to fit the piston. With an ABC piston/sleeve set-up, this is oftentimes reversed with the sleeve honed to a specific size and then the piston o.d. honed to fit the sleeve. This is due to the fact that once the sleeve has been chromed you are limited to the amount of material that can be removed from the sleeve by honing. The chrome itself usually only being up to a half thousandths (.0005") thick. With K & B's new CNC machines, both the sleeve and piston are finish turned with no additional grinding or honing. The sleeve is chromed and then lightly "kissed" on the hone to remove slight roughness formed on the chrome surface during the chroming process. The pistons are then selectively matched to the sleeves.

The sleeve has K & B's "Quintuple" Schnuerle porting which is two transfer ports — one on each side of the exhaust ports — and two boost ports opposite the exhaust ports. Although referred to as 5 port design there are actually 6 openings in the sleeve when you take into consideration the two exhaust openings. However, the exhaust port opening is just considered as one opening as the center divider is just a support web. The exhaust port has been given an unusual shape by notching the upper corners. This extends the width of the exhaust port at the top whereas it could not be widened the full depth without running into the two side transfer ports. The sleeve flange has a machined notch that matches a pressed-in steel pin in the crankcase casting to accurately locate the sleeve and eliminate any chance of port misalignment.

The connecting rod is machined from bar stock aluminum and has a bronze bushing at both the crankpin and wrist pin ends. The tubular wrist pin is left solid at one end and is retained in the piston by steel wire retainers. A small cut-out is machined into the side of the wrist pin hole to ease removal of the wire retainer. The wire retainers do not have small ends to grip for removal. These small ends have been known to break off due to flexing in engines using them in the past, so K & B eliminated this problem. With no bent ends on the wire retainers to grip for removal, the piston notch was required. Otherwise it would take a lot of "picking" with a pin or other tool to remove the wire clip.

The massive crankshaft is machined from "Stressproof" steel and has a separate pressed-in hardened steel crank pin. Counter balancing is achieved by milling internal cut-outs in the sides of the crank disc; the crank disc then covered with an aluminum ring to provide crankcase packing. It is basically the same type of crankshaft as used on other performance engines in the K & B line.

The crankshaft rides on two of K & B's high rpm plastic cage bearings. The rear bearing has an o.d. of 28mm (1.102") and i.d. of 15mm (.590"). This is the same bearing as presently used on the K & B .61. However, the K & B .61 is of front rotor intake design and as such utilizes a hollow drilled shaft. The new .67 uses a solid shaft. So, although both shafts are of the same outside diameter, the .67 shaft being solid is considerably "beefier" and stronger. The front bearing has an o.d. of 24mm (.945") and i.d. of 12mm (.472"). This is the same bearing used for a rear bearing in the K & B 7.5 inboard marine engine. The use of a flywheel calls for an exceedingly heavy duty front bearing and K & B has taken this into consideration.

I know that few of you out there are familiar with how head and combustion chamber shapes are machined. This is normally done with a "form" tool. That is, a tool that has been ground to the desired shape that the finished part is to have. With the new CNC machines a single point cutting tool is used. The head contour and combustion chamber shape is generated by information punched into the computer. No form tools are required.

The head itself is of two piece design — the combustion chamber button and the water cooled top assembly. The combustion chamber is of the high dome type surrounded by a .180" wide squish band. The compression ratio computed from the closing of the

exhaust port figures at 7.75-1.

The engine being of rear rotor intake design uses an aluminum backplate casting and a chrome plated steel rotor. This combination has proven itself by use on other K & B rear rotor design engines. The backplate features a giant intake opening of 5/8" (.625) into which can be plugged K & B's newly designed carburetor. The carburetor is, in turn, retained by a double-lock draw bar. The carburetor is similar in design to those used on the K & B .61, 7.5 outboard, and front rotor .40 using a high speed mixture adjustment needle on one side and a idle mixture adjustment needle on the other. Rotation of the carburetor barrel, in turn, moves the barrel in and out. The new carburetor, however, features a removable insert type of venturi extension or draw tube and two draw tubes of different lengths are supplied with the engine. The draw tubes are retained in the carburetor neck by two "O" rings on the draw tubes that lock into grooves machined in the carburetor neck. The high speed mixture adjustment has a knurled tension nut for locking the mixture adjustment with your fingers. No more wrenches or pliers needed to tighten a collet type lock nut that once set makes further adjustment of the mixture pretty difficult unless you have "vice-grip" fingers.

A high performance engine such as this is naturally intended to be used with a tuned pipe. K & B does not supply a pipe with the engine and recommends using one from an after market supplier. Prather Products, Mac's Products, Rossi, OPS, and other manufacturers offer tuned pipes for the 11cc size engine. Included with the engine are two pipe adapters — a 12° for the hydroplane type hulls and a 20° for the deep "V" type.

The fact that the new K & B 11cc marine engine will prove to be a real winner should leave no doubt in anyone's mind. Prototype engines have exceeded existing world records on several occasions and National Champion Steve O'Donnell has been electronically timed at 96 mph with one of the new engine prototypes. One has only to look at the high quality workmanship and detail that has gone into this engine to realize that major changes have taken place at K & B and the new 11cc engine has been worth waiting for.

The 11cc engine is just the first in a line of high quality, high precision engines that will be coming from K & B now that they have the new CNC machines. Future plans call for updating or replacing many of the present engines. So look for many good things to be coming from K & B in the

future.

In closing this discussion I would certainly want to give credit to the man behind the design — Bill Wisniewski, head of K & B's R & D department. Not only did Bill design and build all the prototype engines but made the master patterns for the Investment Cast crankcases. This was not done by an outside professional pattern maker as are most crankcase and related parts castings. However, Bill would certainly qualify in this category.

★

Our first letter this month was received from Bob Ford during the summer flying season. I sent Bob a personal reply shortly after receiving his letter. Bob later sent a follow up note saying the cure had worked. Both the initial letter and follow up letters are being run. It is always nice to hear from you guys when a solution I have given does work.

Dear Clarence;

This letter is in reference to a Saito 45 four stroke engine that behaves in a very strange way.

On the ground this engine behaves exactly as the manufacturer advertises. Following operating instructions on starting, adjusting the needle valves for peak rpm and idle, holding the nose of the A/C up at vertical or anywhere in-between position, the engine runs so sweet you wouldn't believe it. Now set the A/C down and taxi out to the runway, turn into the wind and slowly advance the throttle for take-off. The power comes up nicely but after about 20 feet the engine stops cold.

Now I am a constant reader of your column and I know pretty much what information you ask for as to tank location, holes in lines, prop size, valve setting, glow plug, ventilation (A/C is a Goldberg Eagle 63 engine mounted upright out in the breeze). I have replaced the carb, tank and lines. The fuel used is the formula from your column RCM May '83, 15% oil 5% nitro. At times the Eagle will be prepared as noted above, taxi out and take off and fly like a bird; land, taxi back to the pit, and I can idle down to shut the engine off. Boy, that was great, ***don't touch nothin!*** *Carefully refuel, start up, taxi out, head into the wind, start the take-off roll 20 feet and the engine stops cold. Repeat, same thing. Try again, tweek a little here and there, takes off and flies great, engine stops in flight. I have worn out more shoe leather than a 10K runner going out to the runway and carrying the Eagle back. I have taken every piece of advice no matter how far out from everyone at the field and still the same result.*

Bob Ford
Long Beach, California

Several things could be causing your problem but the first thing to check is the pick-up tube in your fuel tank. If it's too close to the back of the tank it will cause a momentary richening due to surge (fuel going to the back of the tank) during take-off acceleration. The end of the pick-up should be 3/8"-1/2" from the back of the tank. A little more nitro in the fuel might help also. I would go with at least 10% up to 15%. How about the crankcase vent? Any blockage of the drain (if using a piece of fuel line to exit the excess oil) can cause problems. So check for a kink or obstruction here. I believe that either the pick-up tube (clunk) being too close to the end of the tank or not enough nitro in your fuel may be the answer. The engine may be running too cool and requires a little more nitro to keep the fire lit.

Dear Clarence,

Well my Saito 45 is working just fine. Fifteen percent nitro and cutting off the "clunk" pick-up did the trick. Flew all day last Sunday without a hitch. Thank you for the tip, and I might add that the other guys at the field Sunday were quite surprised about the increase in the nitro required

for a four cycle engine.

Yours truly,
Bob Ford
Long Beach, California

Dear Sir:

I read with interest each month your column in R/C Modeler. It may be that you have covered what I am about to deal with in this letter, in a previous column, but if you have, I have not seen it. For the convenience of your reply, I enclose herewith a self-addressed envelope but, for obvious reasons, cannot include a stamp.

I was involved with R/C airplanes in the early sixties but gave it up in frustration with the unreliable radio and only returned to it approximately three years ago. I have always found the mess caused by fuel residue on the wings and fuselage to be most disconcerting and there seems to have been little done to improve this situation between the period of my leaving and returning to the hobby, as above stated.

As a fact, I blame the loss of an airplane this summer on this fuel residue. I built a Pilot Q.B. 40 plane last winter and installed an HB-40 engine in it. The alignment at the end of the muffler with the right side wing hold-down bands could not have been more perfect. The consequence was, after each flight the bands were literally saturated with fuel residue and would snap off the wing with the slightest touch. Because of the design of the wing and the canopy on top of the wing, it was impossible to criss-cross these elastic bands and similarly most difficult, if not impossible, to install wing hold-down bolts.

I purchased two different brands of silicone muffler extensions, but the engine simply refused to operate with them attached to the muffler by reason, I assume, of back pressure. I then tried a small brass elbow (which I had used with success on an O.S. 40 engine) but this was not satisfactory either, even though I tried drilling a series of small holes; first on the inside of the elbow and later on the outside of a second similar elbow. The elbow would work as long as the tank was full and the throttle was wide open, but if I throttled the engine down in the air, it would not return to high speed; it would simply quit. Further, with the elbow, the engine would quit at approximately half tank.

The culmination of my efforts was that I took everything off the muffler, and wiped the wing and changed the bands after each flight. But the inevitable happened --- after about fifteen flights on the plane the wing came off in mid-air at about five hundred feet and that was the end of the problem. Perhaps you know a solution to this problem, in the event that I encounter it in the future?

You will note that I am sending a photocopy of this letter to the U.S. distributor of the HB engine with the hope that perhaps they, too, can offer some solution.

Generally speaking, I am somewhat at a loss to understand why the model engine manufacturers do not (and perhaps they do and I don't know of it) either design their mufflers to point straight down or, alternatively, supply an adapter so that a modeler can have a

choice as to the direction of the exhaust, i.e., conventional as now or, alternatively, up or down, with something similar to a T adapter.

I would appreciate hearing from you. Thanking you in advance, I remain,

D.E. Jermyn
Calgary Alberta, Canada

No matter which direction the manufacturer pointed the muffler tail pipe, there would be an installation in which it would not be acceptable. Having built and flown many aircrafts over the years that used rubber bands for hold-down, I would be willing to bet that you were not using enough rubber bands and the wing was lifting from the fuselage. I can recall many years ago when flying a "Flat Top Stormer" that I was having what I thought were trim problems. The wing was held on by three rubber bands on each side parallel and six criss-cross — total twelve. Somebody suggested changing the wing incidence. I did this by slipping a popsicle stick under the leading edge of the wing. After putting in a flight, the popsicle stick was gone. The light then lit that the wing was lifting. Four more rubber bands cured the lifting problem as well as trim problem. It would also seem that for the rubber bands to come off you must be using hold-down dowels that are too short. How about longer dowels and you might even try notching or grooving the ends. It would be almost impossible for the rubber bands to come off oily or not.

Dear Clarence,

Got a question . . .

I'm wanting to build a M.E.N. "Big John" biplane. The ads say it will fly on a .60, but I really don't believe it.

When I lived in Oregon, a friend had a Big John with an older O.S. .80 in it. It flew very well and was realistic in its performance. Not fast or snappy, but really big and majestic. (By the way, this part of Oregon was about 500 feet above sea level.)

In case you don't recall the Big John, it has 76" wings, about 1800 square inches of area, and probably weighs around 12 pounds. It's similar to Chuck Cunningham's "Lazy Ace" as far as size goes. I don't recall if the wing was flat bottom or semi-symmetrical.

Now my question . . . the most powerful engines I own are an RJL-Kraft .61 and an Enya 60X. Here in Amarillo, we're at about 3500 feet elevation. Our club uses 5% nitro, 50-50 castor synthetic, and the engines seem to run fine. Do you think either of

to page 72

these engines have sufficient power for the Big John, or would the plane be just marginal?

Do you think I should consider going to a Fox .78 or the new Super Tigre .75, or even going up to a .90? I really don't want to spend that much money.

This being a fairly large model, probably having considerable drag, do you think this would be a good candidate for a diesel conversion? Would that give me the extra pull without the expense of buying a .90?

Thank you so much,

John Stubben
Amarillo, Texas

Bill Northrup, Editor of Model Builder Magazine and designer of the "Big John," would be the fellow to write to with questions in relation to your airplane. However, the ship will fly with a .60 size engine but do not expect to do much more than level flight. Any climbing maneuvers are pretty well-restricted without a dive to build up air speed. You might also have a rough time handling the ship on a windy day.

My recommendation would be to go with at least the Fox .78 and preferably something like the O.S. .90 that has replaced the old O.S. .80.

If you do want to stick with a .60 size engine then a Davis Diesel Conversion would be the way to go. This would let you turn a lot larger prop without overheating problems. You still would not be into the O.S. .90 power category, however. With a 14/6 prop you would be close though. Fuel costs (consumption) would sure be a lot less if this is a consideration.

Dear Mr. Lee:

I am writing this letter to try and find out one of the mysteries of the R/C engine. My Super Tigre S-40 mounted on a Quickie-500 is kind of "seasonal." I have run this engine for two summers

and performance is just flawless, good idle, transition and high end. However, in the early spring and mid-fall (temperature approximately 40°) the engine will not run except at full bore. Fuel will not stay primed before start of the engine. The only way the engine will start is throttle at full setting and primed. As soon as the throttle is backed off even a fraction, the engine will die. I have done everything I could think of, including talking with the people at World Engines.

Everything they suggested I have done --- changed fuel tank and lines, checked muffler pressure fitting, installed new ring and sleeve, changed glow plug and including different brands, tried different fuel, tore down carburetor and inspected for burrs. This engine has been run on Cool Power 10% fuel since day one.

I'm hoping you might be able to suggest what might be the problem with this engine. It's kind of no fun to fly this way (at full bore) and have to run out of fuel to land dead stick every time.

Keep your fine articles coming in this great R/C Magazine. Thank you kindly in advance for your concern.

Very truly yours,
E.N. Zam
Oregon, Ohio

When cold weather comes along a lot of problems that have not shown up in warm weather begin to crop up. Engines run cooler and there is less fuel vaporization which makes starting more difficult. The viscosity of the fuel is also higher so that the fuel does not flow as well. You usually have to open the needle valve more for high speed operation which in turn makes the engine idle richer at low speed; especially if castor oil based fuel is used. Synthetics do have a decided advantage in cold weather.

In years past, engines had exhaust baffles to help keep the glow plug hot at idle. When mufflers and tuned pipes came along the baffle was eliminated but this does not mean that it still is not needed. Mufflers and tuned pipes do make a little back pressure at idle to help keep the plug hot but not near as much as the old baffle. A lot of idle and acceleration problems with our present engines could be eliminated by the use of the old exhaust baffle.

Adding a little (2%-3%) Propylene oxide (an igniter) to your fuel might help. Increasing the nitro content of your fuel to 15% might help also but should not be necessary if your engine is in good shape. I would guess that even though you did replace the ring and sleeve you may not have a good compression seal. It takes a good compression seal to create combustion pressure and heat. A symptom of an over the hill engine is loss of idle followed by difficult starting. In hot weather this is not as noticeable due to the engine running hotter, but in cold weather it begins to show up. Most often when a ring is replaced, the piston needs replacing also. Ring seal against the piston land is just as important as seal against the sleeve wall. Worn wrist pin holes in the piston and upper end of the rod can lower the compression and change port timing; in turn, affecting the idle and starting.

□

FLYIN' FOOLS

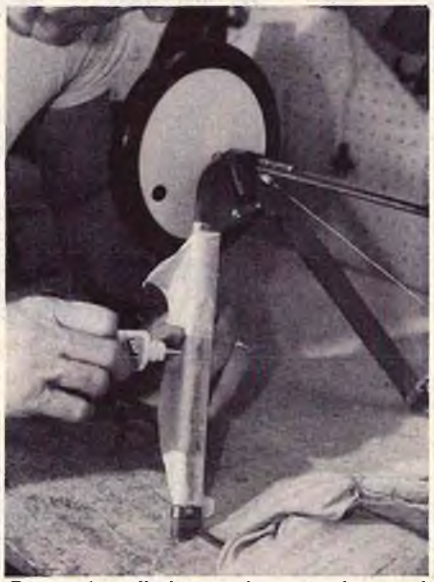
by Jim Dalton

BIG IS BEAUTIFUL

Dick Phillips

Appropriate length of dacron is tack glued to back side of wooden strut. Dacron should be pulled tight between two dots of glue.

Once pulled tight, seam is glued from top to bottom so that edge of dacron is glued to back of strut.



Dacron is pulled around strut and second glue joint is made right over the first one.

One of the best things about this hobby and one which gives me a great deal of enjoyment, is the solving of problems. Over the years I have passed some of my solutions to some of our problems along to you. Judging from the response, many of you have benefited from some of them and that is naturally pretty gratifying.

I ran into another one recently when it came time to put the finishing touches on my Balsa USA Sopwith Pup. It is one third scale and is all but overwhelming when seen assembled. It's a "humoungous" airplane and no doubt about it. So are the roundels which appear on both the top and bottom wings. One on each side, four in total. They are over 18" in diameter and I can tell you there are no decals available in that size!

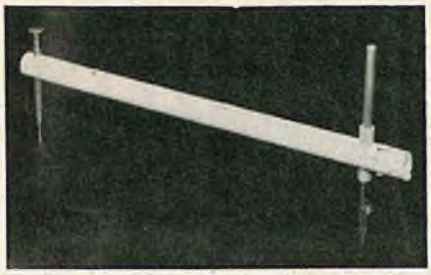
A sharp knife is then used to remove the excess dacron.

So, what to do? Painting them freehand was a solution quickly discarded as not being neat enough, considering my rather shaky approach to such painting. I just cannot do it well enough to make the attempt. An alternative method was to make masks out of Mac-Tac or some such material and was tried, but the sheer size of them and the undulating surface of the wing made it impossible to get them to lie flat on the wing covering and that effort had to be abandoned. I considered a material called Frisket which is a rubbery compound painted onto the surface and then removed by cutting with a sharp knife and peeling the areas to be painted. On the Dacron covering material, that seemed pretty dangerous as almost any pressure would have sent the knife through the material.

The solution I eventually used was a combination of free hand (well, almost) painting and ruling the lines with a ruling pen. The ruling pen is a draftsman's pen for ruling straight lines in conjunction with a T square and lays out a very good line on almost any surface. The width of the line can be varied a bit by adjusting the pen's two blades.

I suspected that a ruling pen would also work with paint, if thinned to the correct consistency, and this proved to be correct. The paint needs to be

A heat sealing iron will then pull the material very tight on the wood fairing strips. Glass or epoxy resin is then painted on the cloth and the resulting dacron and resin sheath secures the fairing solidly to the wire gear leg.



Beam compass for marking out large roundels. Scratch awl at left end, ruling pen at right. Four holes produce four appropriately sized circles.

Three circles drawn and painted, note small scrap of wood taped at center to prevent scratch awl point from penetrating fabric covering.

Roundel in place on upper wing panel. Chord is 22 inches. Spraying with flat clear eliminates shine in Olive Drab base color and conceals brush marks in roundel.

thinned to about the same viscosity as would be used to spray it, so nothing is lost by making it compatible with the ruling pen.

I made up a simple beam compass by drilling a few appropriately sized holes in a piece of plastic tubing. The tubing used should be quite stiff in order to work as a firm beam. The holes were drilled to accommodate a scratch awl at the base of the beam (inner or swinging point) and slightly larger to accommodate the ruling pen at the correct locations to make the proper sized circles.

Starting from the outside edge of the roundel, a circle is drawn with, in this case, white paint. Then careful brushwork with a small brush fills in with white up to the line and far enough toward the center of the circle to make up the outer white area. Then the ruling pen is set up at the next hole and a blue circle is made and filled to the line with blue. The same procedure is followed until all the circles have been done and the roundel has been completed. I used acrylic lacquer to do the ones shown and outside of the brush marks being a bit more visible than I'd like, they looked quite good. In the case of the Pup, they are over-sprayed with a flat clear so the brush marks will all but disappear. Since they are all sprayed with the flat clear, any paint which would be compatible with the overspray of clear would be okay. I happened to have the right colors in acrylic so I used them.

Painting up to the fairly thin lines made by the ruling pen is not really all that difficult. The painted line is raised a bit from the surface of the covering material and seems to act as a dam against paint flowing past it. I guess it could be capillary action which causes the paint to flow up to the line and stop, but whatever it is, it works very well indeed. In the case of very large insignia or markings, the ruling pen filled with paint is about the best solution I have found in the creation of very large roundels and, for that matter, anything you could draw on the surface to be painted. If you don't have a set of drawing instruments, adding a ruling pen to your tools may well be a good idea. The beam compass was made up from tubing I had lying around in the shop, but a piece of doweling or a simple wood strip would work equally well.

As mentioned above, the ruled line does stand up a bit from the surface of the covering material but it has a much softer edge than would be the case with a masked paint line so it looks like just what it is, an insignia painted onto the surface with no really hard masked line around it. Also, there is no danger of it lifting as might be the case with a masked surface or a decal.

I've built a couple of large models from kits lately, both of which required wooden struts to be attached to the landing gear wires. Getting such struts to stay in place properly under landing loads (we fly off grass strips here) is a bit of a problem. I have glassed them in the past but I don't seem to be able to get glass smoothly in place and still permit the wood grain to show through.

The models have been the Mono Fly Baby and the Sopwith Pup from Balsa USA, both of which require wooden struts to fair the landing gear wires. The accompanying pictures show a method of doing this that turned out well, and seems to work as well. I used the Dacron covering material I have mentioned here before, cutting a strip that was the correct length for the struts. Using one of the cyanoacrylates (Hot Stuff, Zap, etc.), the strip was fastened to the backside of the strut, gluing a thin strip from top to bottom. The cloth is then pulled tight around the strut and glued again, right over the first glue joint. Once this has cured (almost immediately) the cloth is then shrunk with a heat iron which pulls it very tight. The Dacron has a shrink factor of about 25% so it will pull up very tight indeed. Once shrunk in place, a coat of resin is applied and the wood will show through as intended and the cloth becomes all but invisible. In both of the examples mentioned, the wood was stained with a redwood stain prior to adding the cloth. It's a good idea to let such staining cure well before trying the above procedure as the resin does not set up well over fresh stain. A couple of weeks should be allowed between staining and adding the resin.

This method of securing the struts to the wire makes a very good, tight connection between them and also has the benefit of strengthening the wood. Both of the above kits use redwood for the strut material and since it is a relatively soft wood, it's quite easily cracked or broken along the grain with any rough treatment. This is especially true if the wood strut is slotted to take the wire landing gear as is the case with both of the kits mentioned. The procedure shown in the photos works well and is quite easy to do with readily available materials.

The Sopwith Pup is now ready for flight (if we ever get some decent weather) and balancing the bird was a bit of a problem. That it would be tail heavy upon completion went without saying. It has a short nose moment, as is common with World War I airplanes, and the requirement was for **ten pounds** of weight in the nose. The model weighed in at 24 pounds without the weight and this amount of lead will take the weight to 34 pounds, which is a bit heavy, I thought. However, with 30 square feet of wing area, the wing loading will come out at just a tad over 18 oz./sq. ft., which is not too bad at all. Any lighter than that and it would be such a floater I'd have to take a long pole out to the field to knock it out of the air!

How do you get that much weight in the nose without problems? I wondered the same thing until I

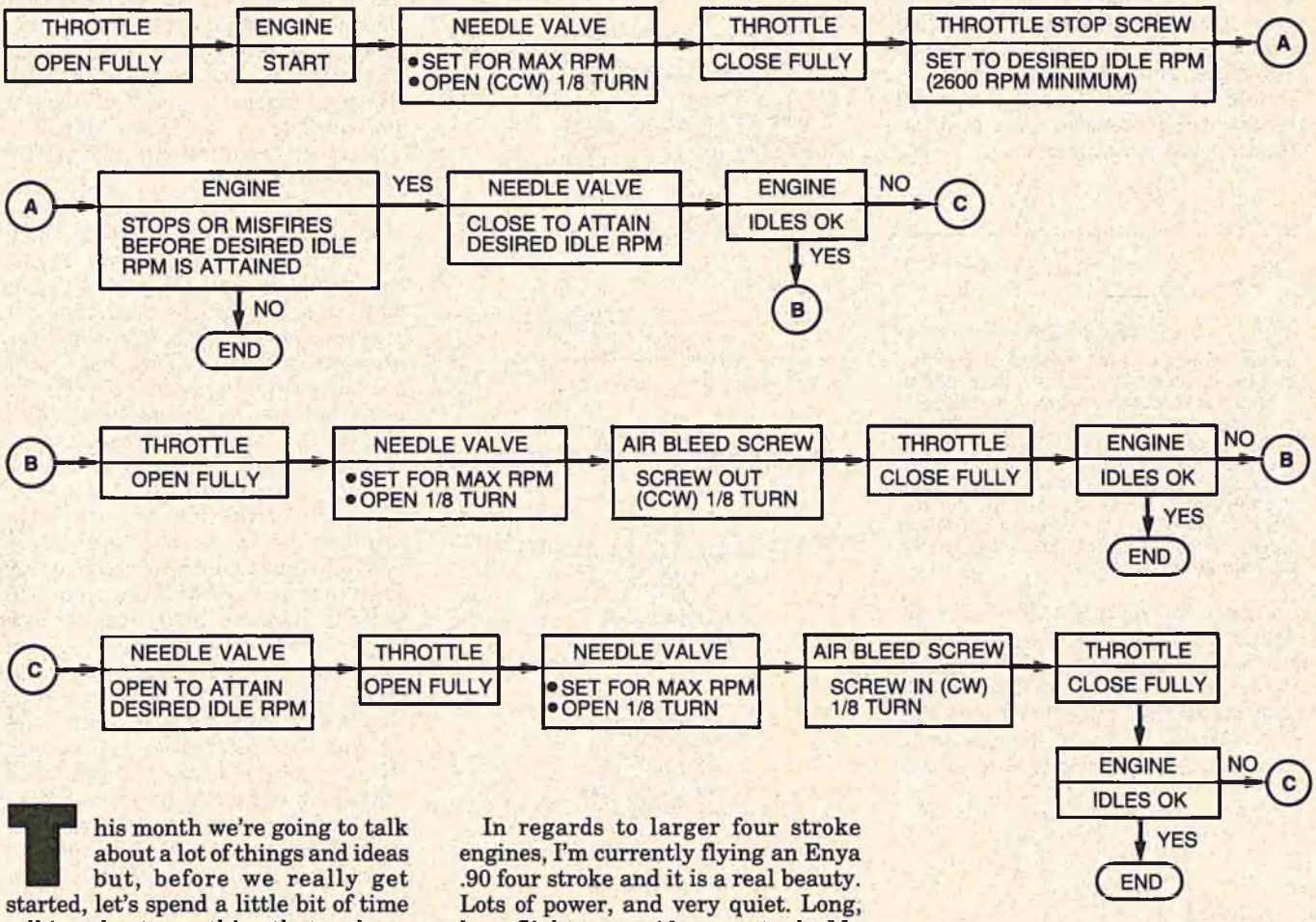
to page 203

Roundels add significantly to model's appearance. No decals this size available so you'll have to paint them on. Method detailed in text makes it easy to do and very accurately.

CUNNINGHAM ON R/C

Chuck Cunningham

THROTTLE VALVE ADJUSTMENT



This month we're going to talk about a lot of things and ideas but, before we really get started, let's spend a little bit of time talking about something that we have mentioned in the past. That is the ever growing use of four stroke engines. Most of the phone calls that I receive these days are from modelers wanting to use a four stroke engine in one of my designs. Hardly anyone calls any more asking about a two stroke engine.

The four stroke movement is really here and it's no wonder. Those of us who have become fans of the four stroke engine are fans because of several factors. First, and foremost, the noise level is almost non-existent. Second, the ability to swing larger props at a slower rpm allows for flying larger models. Third, the fuel consumption is just a bit over half as much as a high revving engine. Fourth, the engine idles much slower (a factor of that larger prop among other things). Fifth, the availability of a wide variety of really fine four stroke engines from a .21 all the way up to a 1.20.

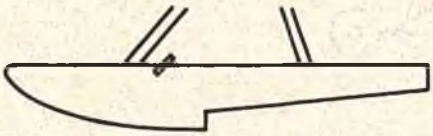
In regards to larger four stroke engines, I'm currently flying an Enya .90 four stroke and it is a real beauty. Lots of power, and very quiet. Long, long flights on a 10 ounce tank. My good buddy, Al Wileart of A & M Model Supply, is thinking of hooking up a couple of Enya .90 engines on one of his beautiful prop drive units which would make a truly fine 1.80 drive, yet not putting out the high speed whine so familiar with the normal prop drive set-ups. And, again, speaking of Al, he's the motivating force behind the latest fly-in to be held in this part of the world — a Four Stroke Fly-In, to be held at the Mountain View College campus flying field, just south of Dallas. The event is scheduled for the second weekend in May. It should be a fun two days.

As most of you know, I like the larger aircraft, but am not hung up on the chain saw type of model. I have several of this size, and a couple more in the building stage. I really enjoy flying the models that range between the standard .60 aircraft size and the Quadra powered size --- the seven footers pushed around by a .90 engine, and now being pushed by the larger four stroke. I like this size for several reasons. First, they are large enough to see in the air and, second, they are small enough to be easily transportable in most automobiles. If you're thinking along these lines for your winter project, go ahead and get your feet wet, you're going to find that you will enjoy the larger models, and the larger four stroke engines. Haven't had a chance yet to try out any of the new 1.20 size engines, but hope to rectify that in the not too distant future.

A couple of months ago I mentioned that I had received a letter from Bill Kawai. Bill lives in Japan, and kindly offered to do some translation for me from Japanese model magazines. He also offered to try to keep RCM abreast of what's happening in Japan in the modeling scene, which he has done

through correspondence with Dick Kidd. Bill did some translation for me concerning the design of floats for rise off water flying. Here is a bit of the information.

Breather: Floats will get wet. Then, when heated by the sun, the air trapped inside the float will expand drastically. A breather tube should be installed in the float to allow it to breathe. A small aluminum tube can be epoxied to the top of the float to act as a breather. It should be angled slightly to the rear and raised about 1/2" to prevent water from entering. It should be placed near the forward mount location, never in a position that it could be submerged.



BREATHER

Floats will get wet then heated by the sun, causing temperature changes, thus, the air inside must be allowed to breathe. As shown in sketch, a small aluminum tubing is epoxied to the top of the float to act as a breather. It should be tilted slightly to the rear and, raised about 5 mm to prevent water from entering. Furthermore, since the canopy on the fuselage will expand and contract similarly, a breather should also be installed to allow free passage of the air inside.

Figure 1. Floats should be set up with a small amount of toe-in (2°-3°) just as the wheels on a tail dragger. **Figure 2.** The step of the float should be positioned in a range of 10° with the CG. **Figure 3.** Basic design on a standard float. The bottom line of the float should be perfectly straight, not curved. **Figure 4.** The wing chord line and the top of the float should be parallel. **Figure 5.** The spread of the floats should be about 60°, or not more than 1/3 of the wingspan.

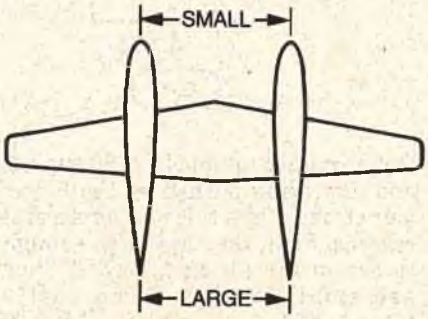


FIGURE 1
FLOAT "TOE-IN"

FIGURE 2
POSITIONING OF FLOAT STEP

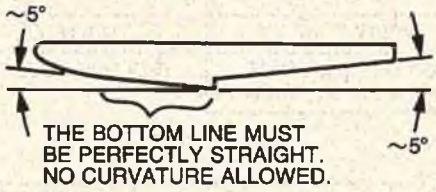


FIGURE 3
KEEL ANGLE

FIGURE 4
FLOAT ATTACHMENT ANGLE

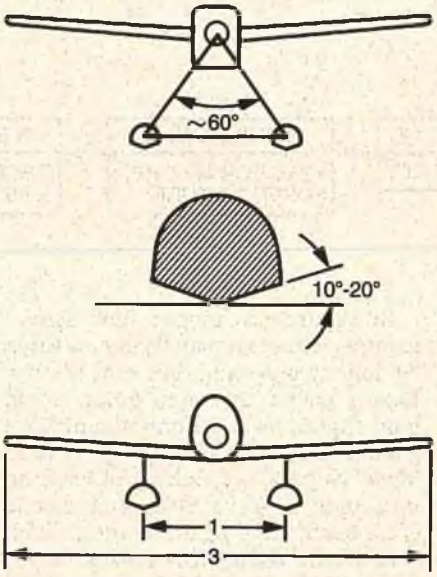


FIGURE 5
FLOAT SPACING
(DOUBLE FLOAT)

While on the subject of Japan, I received a letter from Forrest Merchant telling me that he thought that the throttle and needle valve setting information that came with his new import engine was less than perfect. Forrest took the time to break down the method of setting the carburetor into computer logic diagram form. A copy of this is presented here, and really applies to almost all carburetors. Thanks for your help, Forrest.

Last night I received a call from a modeler who was wondering about putting a four stroke engine in my Sporty Ace design. Of course, this is okay, but during the course of our conversation we talked a lot about tail draggers, and the problem that he was having with one of the kits that he had built but had changed into a tail dragger configuration. This kit is the typical "Stick" type model with a top mounted wing, slab horizontal stab, and trike landing gear. His main problem is that when making a take-off run the aircraft races madly down the runway, twitching from side to side, and then finally leaping into the air with a great burst of too much climb. Bet that this has happened to many modelers. With the returned emphasis toward scale building, and the fact that most scale projects are tail draggers, I think that it is time once again to take a short look at the care and feeding of a tail dragging aircraft; how to design them, how to build them, and how to fly them or, to be more precise, how to take them off of the ground.

First, there seems to be a wild misconception about how to make a tail dragging aircraft part company from the runway. Go out to your local airport and watch the take-off run of any aircraft that has a tail wheel and two main gears. Watch a light plane, then, if any are flying in your area,

Here is the range of airplanes flown at the Golden Valley R/C Association's 4th Annual Open House. The spectators were able to see a wide range of models flown.

Phil Ammann tells all about his Godfrey plans Super Stearman. It weighs 32 lbs., and is powered by a 2.4 Kloritz engine.

watch a DC-3 or any similar type aircraft. What happens? As the aircraft begins to pick up speed, the first thing that the pilot does is to feed in down elevator to lift the tail off of the ground. Why? So that the aircraft will be in normal flying attitude. The aircraft roars off down the runway tail high. As soon as the pilot feels that the aircraft is light on its wheels, he gently brings the stick back, feeding in up elevator and the aircraft lifts off into the wild blue. Why, then, do so many modelers think that a tail dragger must make its take-off run down the runway with the aft end firmly stuck to the ground until shear engine power causes the model to leap into the air? If this were a full scale aircraft, that leap would be quickly followed by a firm crunch.

It's foreign for most modelers to hold in a little down stick when making a take-off, so simply add a bit of down trim to the elevator. This lifts up the tail as soon as the throttle is advanced, allowing the aircraft to make a normal take-off run. You do have to be careful in adding down trim as you don't want to add so much that the aircraft will dump over on its nose. Just a bit will be enough. How much is a bit? Well, start off with about 1/16" down from normal, perhaps less if you are flying a smaller model.

To go back a bit, when designing the early Quarter Midget racers (which were flying at that time on O.S. .15 engines), it was common practice to design the tail end of the model with 1° positive in the horizontal stab. This 1° positive did the same thing as a bit of down elevator trim. It allowed the tail of the aircraft to rise up on take-off so that the aircraft could quickly gain flying speed and be off toward the first pylon. How about full size aircraft? Take a look at the scale plans for a Fokker D-VII. This aircraft had a stab angle of positive 4° to 5°. This was to overcome the lift of the undercambered wings, and to prevent a quick stall. Many light aircraft have adjustments built into the horizontal stab to allow the aircraft to be rigged with a bit of positive in the stab.

On my tail dragging design I like to use the slightly lifting stab airfoil. This allows the tail end to be set at zero, yet lifts the tail on the take-off run for an easy take-off. This stab section has the added plus of allowing the model to slow way down on landing, letting you drop on in for an easy three point landing.

One factor that I have changed my mind about the past several years is the placement of the main landing gears on a tail dragger. I used to believe that the best location was to have the axles just under the leading edge of the wing. Now, I feel that the wheels can be placed further forward, with the back edge of the wheel about in line with the leading edge of the wing. The take-off run seems to be more straight with this set-up, and coupled with the down trim in the stab, or with a lifting stab, the tail still pops up quite rapidly, and everything is a quick go.

As far as building a tail dragger, you must allow a bit of plywood inside the fuselage at the location of the main gear to add a bit of structural support for this area. You don't want to have the landing gear ripped off of the aircraft just because you made a little error and landed in the grass. □

SCALE VIEWS

Col. Art Johnson

Too detailed for your scale presentation but this photo shows manufacturers logo and data stenciled on blade. Aeroprops on F-82G all-weather fighter.

Scale props are a must if some models are to look like the real aircraft. It is easy to build up a collection. They are never on the plane when it crashes.

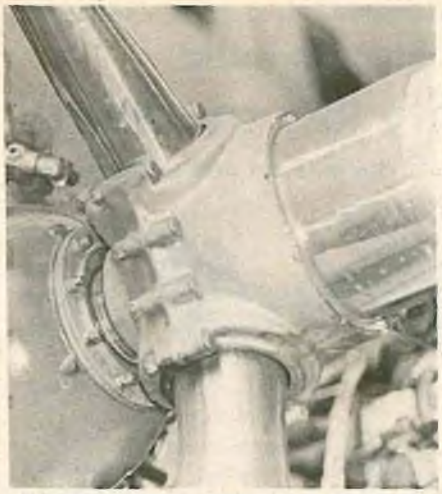
Scale Propellers:

Scale props for models of aircraft are very often an afterthought. I have built a number of scale models, finished and flown them without giving much thought to a scale propeller. Then you decide to take the model out and shoot a few photos and you suddenly realize that the model looks pretty strange with the little toothpick stuck on the front. This problem can be much more visible on some aircraft than on others simply because the propeller has a direct relation to the horsepower turning it.

Models of some low powered lightplanes can be flown with model props that are close to scale size. This is possible because engines of these aircraft drive the prop directly rather than through a gearbox, and because we now have model ignition engines that run at lower rpms, or we have model engines that can be geared or belt driven to turn the prop at lower rpm. Makes it nice when you can find a standard model prop that, with a little rework, can be made to resemble the real thing.

When you get into models of the higher powered aircraft, the propeller becomes a much more important part of the aircraft outline. The huge four bladed propellers of the P-51 and F-82 are a distinguishing characteristic of these aircraft. In fact, this is true of just about all aircraft with enough horsepower to require three or four bladed props. When you stick your little high speed two blade model prop on one of these birds, it does not look as though it should fly and it certainly changes the look of the aircraft while it sits on the ground.

Will we ever be able to fly a model of a fighter type aircraft with a real scale size prop? I do not know but, at the present time, it is a pretty tough task. Our model engines develop maximum horsepower at rpms three to five times that of the ignition engines powering WW II fighters. In addition, the propellers on these aircraft were geared down to turn at about half the rpm of the engines. Those big fans were only turning at about 1500 rpm in flight which is below the idle speed of most of our model engines. The type props we use on models will not even taxi the model at 1500 rpm much less fly it. The Byron P-51 model makes a



Pre-WW II props were often left in the natural metal finish. This is Hamilton standard on an R-2800 P & W. Hub is more work than plain spinner.

This shows how to taper the cuffed end of blade towards the round hub. Curtis Electric prop on WW II Wildcat.

Balsa blade roughed out with sharp knife ready for sanding block. This one is a reject, shape not right. If at first you don't succeed, try . . . try . . .

good try at getting a more scale-like propeller on a model. The Quadra engine peaks out at a lower rpm than our model glow engines. Geared down with a belt system, it is able to turn a four bladed prop of respectable size. Even with this system, however, the prop is turning about 3500 rpm in flight, or more than twice the rpm of the real P-51 prop. As a result, the Byron P-51 prop is still somewhat less than scale size --- a great effort to get more realistic appearance and performance, but not yet exactly scale.

If we are stuck with flying most of our models with one of the little high speed two bladers and we want to photograph the model so that it looks real or the competition bug bites you, then there is no choice but to make a separate scale prop for ground use only. In AMA competition, the rule book recognizes the fact that you are probably not going to fly with a scale size prop. You are allowed tc substitute a scale prop and spinner for static judging so that the judges can get a look at how the model really should look. The prop blades can be totally different from your flight prop but the spinner must look the same except for the number of holes for the blades.

Most modelers wind up having to

make their own scale propellers. Few kits include a scale prop, most do not include material for one and some do not even have a drawing of the real thing. Fortunately, most aircraft three views include the prop and have a reasonable drawing of the blade shape. Tables of aircraft dimensions are listed in different publications for the more popular aircraft and these usually include the propeller diameter. This makes a good check against the three view. For example, the four blade cuffed Hamilton Standard used on the P-51D had a diameter of 11 feet 2 inches. This would come out to a 26.8 inch prop for a 1/5th scale model. Determining the true shape of the prop blade can be a bit more difficult. A front view photo or three view will not show the exact

Balsa blades ready for installation in balsa spinner. Pitch angle is set when you glue blades in place.

New 1/3 scale pilot from William M. Hawke of Columbia, Maryland, dwarfs model of A-26 by T/Sgt. Bob Johnson of Eglin AFB, Florida. Pure coincidence but the 1/3 size pilot bears a striking resemblence to the builder of the 1/18 size O.S. .10 powered A-26.

Dave Platt's 1/5.5 scale Zero on nice take-off at the King Orange scale contest last summer. O.S. .90 powered, the Zero placed second in Sportscale.

Vito Tomeo's 1/6 scale P-47 landing at the King Orange. The 20 pound model powered by an O.S. .90 with belt drive flew in Giant Scale.

Scale props add character to Art's F-82E model. Twin O.S. .60 FSR powered, the F-82E was first in Sportscale at the King Orange.

Ton Velosky's 9.5 pound Cougar flew well at the King Orange. Model has brakes, and canopy with pilot's moving arm controlled by servo. Jet Hander Hobbies' kit with K & B 45 fan engine.

shape of the prop because the blade is set at some pitch angle to forward flight and it is twisted along the blade to maintain pitch with diameter. The same goes for the side view unless you run across a photo of the bird with the prop fully feathered and you are not going to find these for single engined planes. Your best bet is to check photos from different angles and correct the drawings to match what you see. After you carve the blade you can place it at the same angle as the photos and check again. If it looks right, it probably is right.

Making a scale prop where the blades are set into a scale spinner is easier than making one where the variable pitch mechanism is exposed to view. I use balsa for both the blades and spinners of most of my scale props simply because it requires less work than with any other material. Balsa props are less rugged than those made from bass or other hard wood, but they are going to be on the model for looks, not utility. With a little care they will last forever. If you use balsa for the spinner, hope you can avoid static judges who insist on placing the model on its nose for judging. If a full scale aircraft were stood on its spinner, the damage would be even worse than to your balsa job, so don't feel that there is something wrong with your model if the spinner needs the same care that it would on the real plane. A balsa spinner can be easily turned on a wood lathe from a solid block but it is better to glue four blocks together at the center so that the grain pattern is more equal. This avoids a lopsided spinner due to the wood cutting easier with the grain than across it. A cardboard template checks the shape as you work. Balsa is so easily worked that if you do not have a wood lathe, the spinner can be rough shaped with a knife and chucked into a hand drill for final sanding.

to page 100

Prop blades are carved starting with a balsa blank about one third as thick as it is wide. Jigsaw the blank to the shape of the blade pattern and, starting about one third of the way towards the tip, thin the blank towards the tip. This will establish a more gradual change in twist as the pitch is carved into the blade. Look at a photo of the blade you are copying and starting at opposite edges of the blank, start removing material from both sides to get the right twist. Keep the hub end round and remember which side goes forward so the airfoil shape is on the right side. Easy mistakes are to get the twist in the wrong direction for the rotation of the prop or to get the camber of the blade on the wrong side. I have samples of both errors.

When you have the blade roughed out you will probably find that it is a little wider than the pattern as it has been carved from a diagonal of the blank. Correct the shape and finish with an X-Acto plane and sanding block. You will wind up with a prop blade that is going to look right even though it may not have exactly the right pitch at all stations. Who cares, you are not going to fly with it so the time it would take to get an exact pitch prop is not worth the trouble. Besides, you have probably carved a blade for a variable pitch prop and the twist you put in is only the starting point for the real pitch of the prop in use. You will have to decide on this angle when you set the prop blade in the spinner or hub. For example, you have a choice of 23 degrees low pitch to 65 degrees high pitch for the P-51D prop. I would favor the low pitch setting as the prop controls were left at this position for most aircraft on the ground.

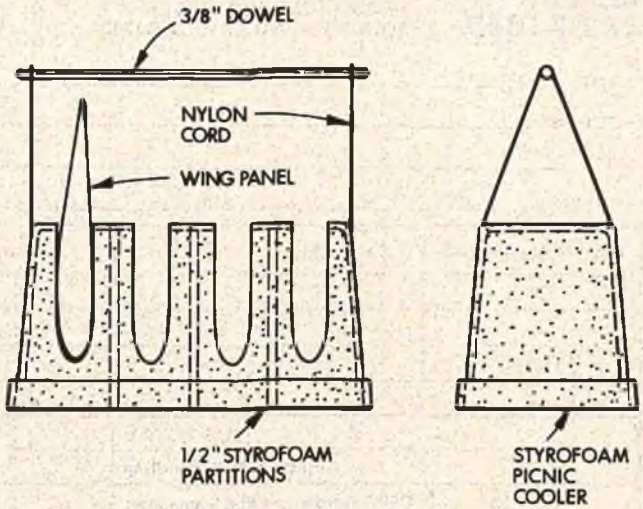
It is easy to get a slick finish on bare balsa with a couple of coats of K & B finishing resin followed by auto primer and maybe some auto surfacing putty to hide your mistakes. When wet sanding with 400 paper leaves an absolutely smooth surface, you can stop with the primer. You are not going to fly with this prop so it will not matter how heavy it gets. Prior to WW II, prop blades were often left in their natural metal finish while, during the war years, all U.S. military props were painted a satin black with identification yellow on the tips. Propellers usually had the manufacturer's logo on the blades when the aircraft left the factory but these were seldom replaced when the props were repainted in the field. Maintenance information was stenciled on the blade near the hub which included pitch settings. Indentification yellow was also used for these stencils on most U.S.

to page 196

FOR WHAT IT'S WORTH

Edited By Jerry Smith

Transporting the four wing panels of a 1/4 scale Fleet bipe without damaging them can be a real challenge. Each panel has protruding brackets for attaching interplane struts, and flying wires must be separated from other panels in storage and transportation. After going through the routine of wrapping the wing panels in foam or blankets and slotting out cardboard boxes, Norm McCormack, Boston, New York, found an inexpensive styrofoam picnic cooler at a local hardware store for 90 cents. This solved his problem. He discarded the top, turned the cooler upside-down and cut four slots the shape of the Fleet's airfoil through the coolers bottom and into the sides. He then fitted three partitions made from 1/2" styrofoam (an old ceiling panel) to reinforce the three center spaces between the wing panels, and cemented them in place. A nylon cord attached to the four corners and a 3/8" dowel make up a handle for easy carrying. See sketch.



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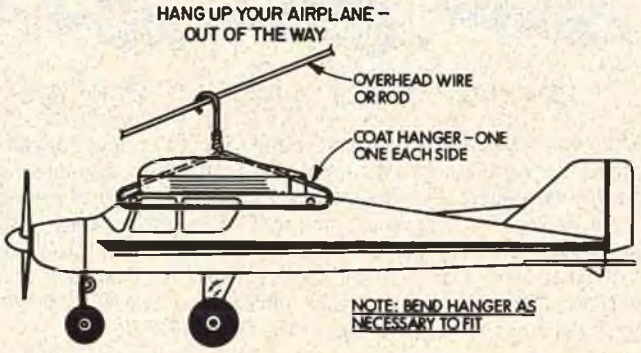
Rick Christoph, Clemson, South Carolina, has found the perfect bag to enclose the battery and receiver and thus protect them from fuel. The bags are sold as disposable feeding bottle liners and have the advantage of being exactly the right size, are quite strong and very inexpensive. They can be found in any grocery store and sure save the mess of trying to custom make a bag out of a standard freezer type bag.

From Steven Curless of Sweetser, Indiana, comes this idea. Two coat hangers make a quick and simple holder for model planes. Just slip the coat hangers over the wing of your model and hang it on a rod or wire. Tape or sponge rubber can be wrapped around the coat hanger to keep it from scraping the wing.

This simple holder allows for easy access to your model yet places it away from dangerous elements, such as house pets or curious children. See sketch.



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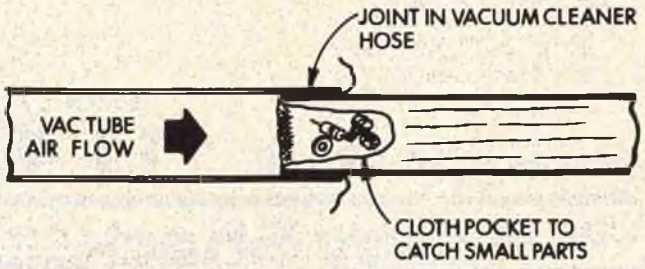
Have you ever lost a small screw, washer, resistor, or diode in your shag rug? Well, here is an excellent way to retrieve it. With a small piece of handkerchief cloth do as follows:

(1) Separate the vacuum cleaner tube at middle section.
(2) Put the center of the cloth on the vaccum tube.
(3) Push the cloth into the tube to make a pocket.
(4) Put the tube together and vaccum the area.

When you hear the small parts tinkle up the tube, as shown in sketch, separate and retrieve the part from the cloth pocket. Thanks to Dick Childs, San Jose, California.

SMALL PARTS RETRIEVER



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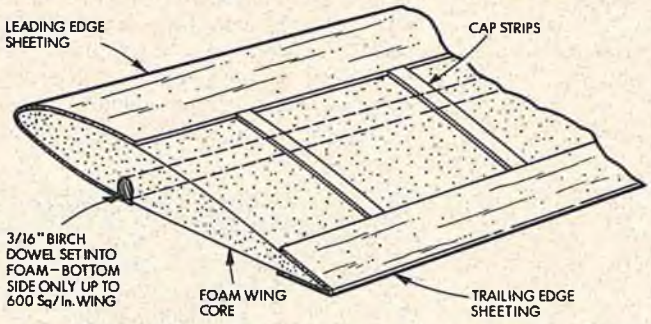
A foam wing is great for true cross section but a finished fully sheeted wing can weigh a ton! Take the sheeting away, however, and you get a "twisty" wing. The problem is especially difficult with tapered symmetrical wings. If you don't fully sheet the wing you've got a weak wing. The answer to eliminating sheeting (plus contact cement) is to build a wing spar. Simply take a piece of 3/16" diameter music wire, heat it with a propane torch and press the foam

wing onto it until the groove has been formed for a 3/16" birch dowel to be inserted (see sketch). Use white glue to secure the dowel in place and let it dry while the foam wing is in its original block. Never leave a wing on the bench to dry without support. If landing gear blocks are going to be placed in this wing, set the dowel so it butts up against the block. This adds tremendous strength to both the block and the dowel. It is unnecessary to use a dowel both on top and bottom of wings up to 600 sq. in. This idea came from Bob Martin, Kirkland, Washington.



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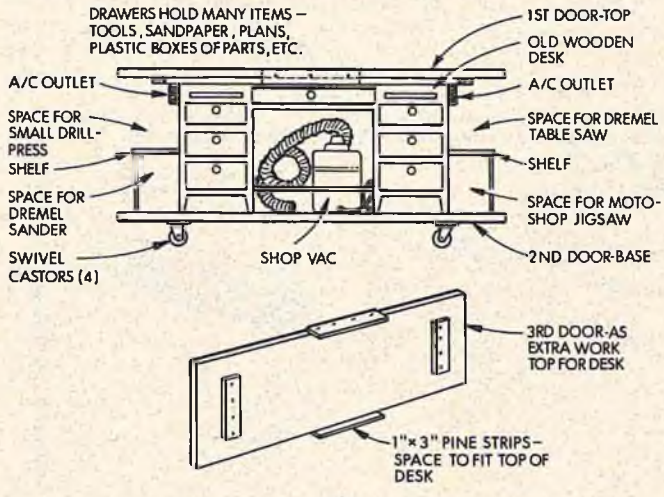
For those of you who have limited model building space, try this suggestion as sent to us from Allen Wehman Jr., of Ladson, South Carolina. Allen picked up an old desk, some flush doors, added casters, shelves, extension cords and built himself a quick and dirty mobile workbench. He can roll it around and get to the other side of his projects. Or, when it comes time to clean up, the Shop-Vac located in the kneehole of the desk is ready for instant use. As you can see, in the sketch, Allen's mobile workbench is completely flexible. Major components: One old desk (and chair); four H.D. casters and bolts; two or three flush doors (the 3rd flush door can be used as an extra workbench top).



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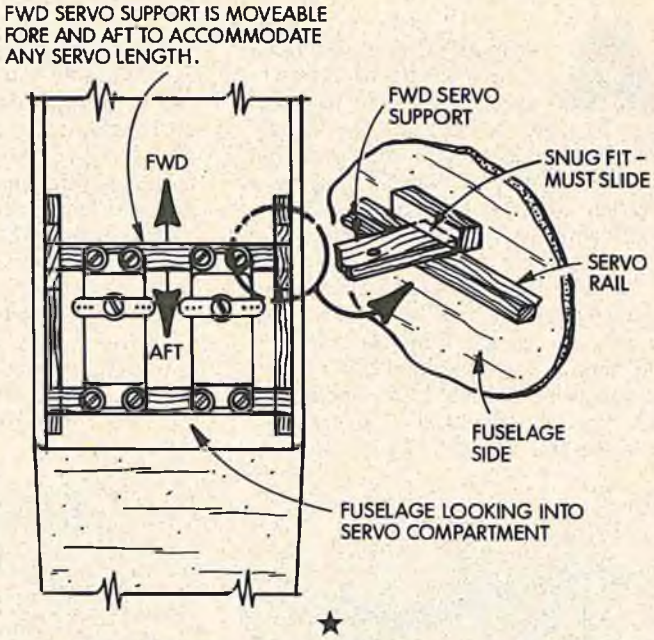
Henri Poulin of Quebec, Canada, suggests a novel way to provide room for mounting servos of different lengths. For one reason or other it may be necessary to change radio gear in your airplane. The servo mounting you now have may not accommodate your new servos. Henri's idea, as shown in the sketch, provides a "floating" forward servo support that will allow any reasonable length servo to be mounted. Once the servos are mounted to the removable forward support, it is held in place. A snug fit, with the rails on the fuselage side, retain it in the other plane.



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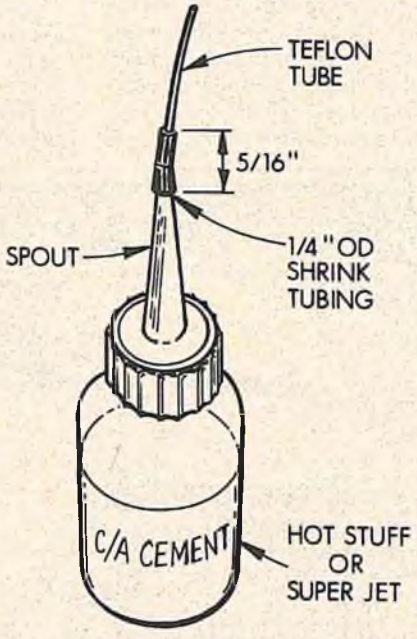
Occasionally when using teflon tubes in Hot Stuff or Super Jet cyanoacrylate adhesives, a seepage occurs between the spout and tube. This is due to the spout being cut off too much or a crack developing in the spout hole while trying to enlarge it so the teflon tube will fit. In either case a 5/16" length of 1/4" OD heat shrink tubing fitted over the spout tip and teflon tubing will cure the problem. See sketch. From Michael Abanshin of Seattle, Washington.



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

OFF-ROAD RACING

Gene Husting

Although ORRCA (Off Road Radio Control Association), has been in existence at least two years, this is their first Nationals, which was sponsored by MRC. ORRCA was formed by a group of tracks in Southern California, so that a uniform set of rules could be established for these 1/10 scale off road cars, and then a series of races started between these tracks. This co-operation of the tracks, working together, helped the off road racing grow very fast here. And now it was time for the first 1/10 scale off road electric ORRCA Nationals.

The 1983 ORRCA Nationals was held at the Del Mar Racing Center in Del Mar, California, and was sponsored by MRC.

ORRCA chose the Del Mar, California track as the site. This track is located at the Del Mar Amusement Center and has been a popular off road track in that area. Three classes of cars would be run. Stock class, which is a stock production car with a stock car. Modified class, which allows the car to be modified, but must use a stock motor, and open class which allows the car to be modified and the use of modified motors. All races are 4 minutes long, which is about 13 laps on this track. The track was in good shape, and between each race the track was lightly watered down to keep the dust down and keep the traction up. A computerized lap counting system was used and everything was ready for Lou Peralta, the President of ORRCA, to start the Nationals.

Coming out of the sweeper, the cars come to a tight left hander corner and a small jump. The fastest way around the track is the shortest way, so the cars closest to the inside of the turns have the best line.

Although this was the ORRCA Nationals, most of the 131 entries were from Southern California and were pre-qualified at local races. Racers who were not pre-qualified were to qualify on Thursday, but Thursday was a very light turnout. Friday was the first big day of qualifying. The weather was perfect, in the low 80's and clear. Everyone got three rounds of qualifying on Friday and three more on Saturday, in stock class, it looked like the lighter Cox cars had an advantage over the Tamiya cars, but in the modified and open classes, the entries were about equally split.

There are two ways to take the Big Jump. Flat out or with finesse. These two cars are using the slower or finesse method. They will land near the bottom of the jump and will be in good position to make the sharp right hander coming up next. This method is used by most experts.

The Amateurs like to take this jump as fast as possible, and will land about 4 feet further down the track, going faster and totally screwing up their approach to the next corner. But, what the heck, they had fun on the jump.

Top Qualifier in the stock class was Dwayne Whisler with 13 laps in 4:19. Mike Giem took the TQ honors in modified class with 13-4:17 and open class honors went to Ron Dyer with 13-4:07. It's interesting to note that the modified cars were only two seconds faster than the stock cars. If you could see the racing, you can understand how this is easily possible. The car is obviously very important, but the driver and a certain amount of luck is also very important. You'll see some cars that are obviously working very good, but the drivers do not have enough patience to pick the proper time for passing. They run very good for a couple corners, but then get involved in a crash with another car, which to them is always the other cars fault. Yet, if they'd show a little patience in passing, they'd be much faster. The guys that win most of the time, obviously have very well-prepared cars, and are super drivers. But they also make their own good luck. When they come up on a car, they don't immediately pass that car at any risk, but they'll take a second or two to pick a safer place to pass, so they don't get hung up with the other car and lose valuable time. They've all learned that a little patience in passing is the fastest way around the track for them. They've also learned that a little patience in going around the corners is also the faster way around. You'll see guys go as fast as they can up to a corner, overshoot the turn, and turn a 10 foot corner into a 20 foot corner. And they'll do it time after time. The good drivers slow down enough when they're approaching a corner, so that they're going around the inside of the corner. The car looks like it's going a little slower this way, but it's definitely the fastest way around the track. Most drivers would do better if they would watch the good drivers and try to drive the same lines as they use. Bad habits are hard to break.

Motors get quite hot in these off-road cars and at this race large finned motor heat sinks were used.

Sunday was main event day and there was a TV camera crew from the That's Incredible TV show shooting all

Resistors also get hot so large heat sinks are also used for cooling. Notice the nerf bars which are a necessity.

day long. They got some **incredible** racing shots, so it should be a great program to watch. It's scheduled for viewing in January, so don't miss it. You'll like it.

Eustace Moore is a real innovator and his complete car is almost all scratch-built and runs extremely well.

Stock "A" Main

The Top Qualifier doesn't always automatically win the Main Event in any form of auto racing, and this is especially true in off road racing. There are just too many variables happening in off road racing to cope with. The start of the race saw Kris Moore in the lead with the Top Qualifier Dwayne Whisler chasing him. But Kris is one of those smart drivers who doesn't make many mistakes and no matter how hard Dwayne tried he couldn't quite catch Kris. He came close, very close, but it was Kris Moore taking the win with Dwayne Whisler 2nd and Lawton Chin 3rd. to page 126

Happy trophy winners in the Stock Class. On the left, Stock National Champion Kris Moore, Dwayne Whisler, 2nd; the Gudvangen ladies who handed out the trophies; Lawton Chin, 3rd; Herbert Hans, 4th; and Larry Grant 5th. Photo by Chuck Connelly.

STOCK "A" MAIN

	Laps	Time
1 Kris Moore	11	4.01
2 Dwayne Whisler (TQ)	11	4.03
3 Lawton Chin	11	4.13
4 Herbert Hanss	10	4.06
5 Larry Grant	10	4.11
6 Don Denny	10	4.20
7 Randy Lutz	10	4.21
8 Scott Sherburn	8	4.11
9 Bruce Reynolds	5	2.14
10 Roy Levy	5	2.16

Modified "A" Main

The Modified "A" Main was an exciting, close race with the lead going back and forth between Chris Allec, Mike Dunn, "Pops" Gil Losi Sr., and Jay Halsey. They each took their turn leading, but in the end it was Jay Halsey winning it by one second over Mike Dunn in 2nd with Chris Allec two seconds back and Gil Losi Sr., one second behind. This was the kind of race that looked like it was staged for the TV camera crew, but it was just good close racing.

Modified National Champion Jay Halsey, on the right, next is Mike Dunn, 2nd; Chris Allec, 3rd; and Gil Losi Sr., 4th. Photo by Chuck Connelly.

MODIFIED "A" MAIN

1 Jay Halsey	12	4.05
2 Mike Dunn	12	4.06
3 Chris Allec	12	4.08
4 Gil Losi Sr.	12	4.09
5 Ron Dyer	12	4.11
6 Derek Schmitz	12	4.13
7 Mike Giem (TQ)	12	4.13
8 Gill Losi Jr.	12	4.14
9 Willie Melancon	11	4.00
10 Eustace Moore	11	4.11

Open "A" Main

These are the fastest cars. The big one coming up. The starts are always exciting because on dirt half of the cars are going sideways. Nelson Kracke took off in the lead but mechanical problems stopped him. The lead changed a number of times in the first few laps, then Gil Losi Jr., worked his way to the front with Mike Dunn close behind. Once Gil gets the lead it's all over. Try as hard as he could, Mike would get close, but Gil doesn't make mistakes. Gil went on to win with Mike Dunn 2nd only three seconds behind, and Will Melancon in 3rd. The TV crews had all four of their cameras going for this race and it couldn't have been a better show!

Gil Losi Jr., on the right, is the Open National Champion, next is Mike Dunn in 2nd again; then Willie Melancon in 3rd; Chris Allec in 5th; and Jay Halsey in 4th. Photo by Chuck Connelly.

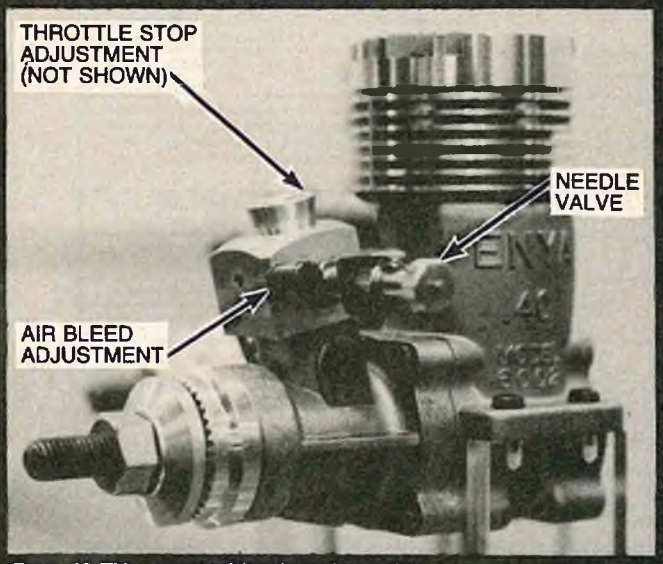
OPEN "A" MAIN

1 Gil Losi Jr.	13	4.15
2 Mike Dunn	13	4.18
3 Willie Melancon	12	4.12
4 Jay Halsey	12	4.16
5 Chris Allec	12	4.17
6 Mike Giem	12	4.19
7 Ron Dyer (TQ)	11	4.00
8 Jeff Maurer	10	4.00
9 Gene Jones	9	4.01
10 Nelson Kracke	2	0.43

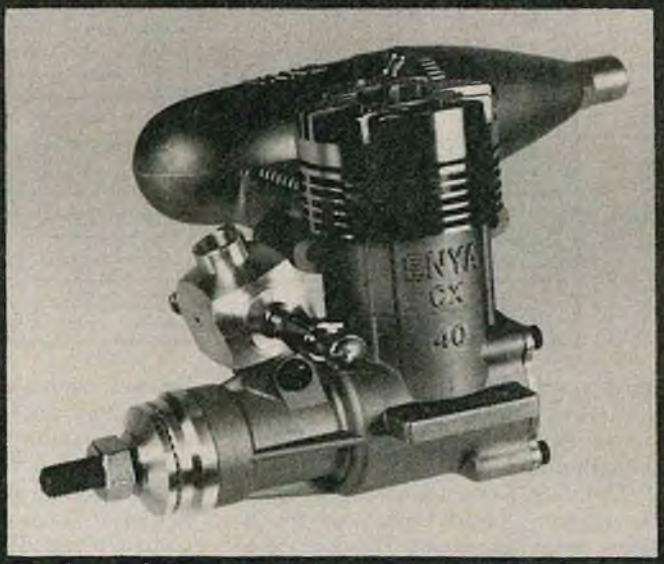
Our congratulations to National Champions Kris Moore, Jay Halsey, Gil Losi Jr., and to Lou Peralta for a very well-run race. A great deal of thanks must go to Tech Inspector Mike Tobey, to Eric Grisham and Greg Parrocha for a well-prepared track and to Lonnie, Kirk, Christian and Mrs. Peralta for running the race. □

THE CARE AND FEEDING OF MODEL ENGINES

By Fred E. Fischer



Enya 40 TV — a good beginner's engine.



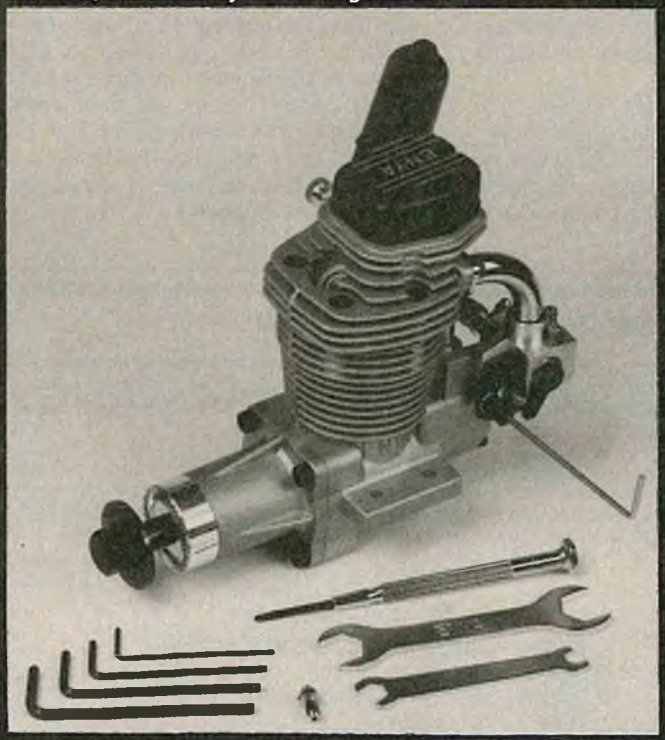
The Enya 40CX TV — a step upward in power and performance for the modeler who has learned the basics of engine core.

A. Introduction

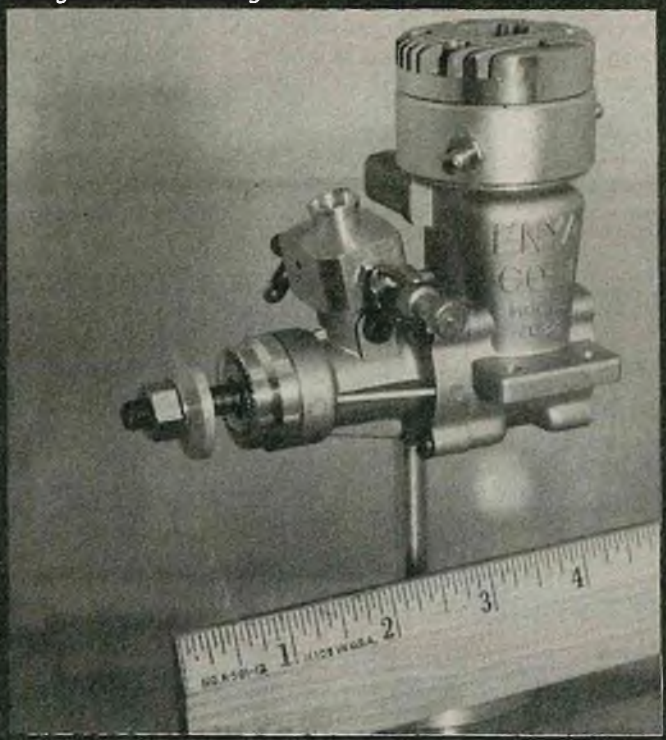
Engines for model airplane, boat, and car uses have been around now for many years. Yet, to the beginning modeler, they are a mystery and often confound the modeler on how to start and operate the engine properly. This article should help reduce the mystery.

Most model engines are of simple two-stroke design. That is, on the upstroke of the piston, an air-fuel mixture is brought into the combustion chamber and compressed. The downstroke is started by the ignition of the engine and the exhaust goes out a port that is usually on the opposite side of the intake port. The simplicity of the engine is because the fuel used in model engines is also the lubricant. Therefore, a separate oil system is not needed. The use of two-stroke design results in a good 'power to weight' ratio, and delivers

The Enya 90 four cycle — a great engine for the experienced modeler, but definitely not for beginners!



Enya 60 IIIB TV marine engine — note the water jacket and hose fittings for water cooling.



TROUBLE	PROBABLE CAUSE	REMEDY
WILL NOT START	Poor battery connection	Check connections to battery and check to be sure clip is firmly and correctly attached to the glow head.
	Weak or dead battery	Either the glow plug has been left connected too long or has short circuited and the battery went dead, so replace the battery and check if the glow head filament will glow bright orange
	Burned out Glow Plug	Replace with a new glow plug and check if it will glow bright orange
	Insufficient fuel inside the cylinder	Inject few drops of fuel through exhaust port and onto side of piston then continue with the starting procedure.
	Engine flooded, too much fuel in the cylinder	Close the needle valve 1 full turn and start again (without pulling fuel into the cylinder).
PROPELLER TURNS STIFF OR ENGINE KICKS	Engine Flooded, too much fuel in the cylinder	Close needle valve completely. (without pulling fuel into the cylinder) Crank the propeller until firing sound starts to come out. After running the engine until the fuel inside the cylinder is burned up, open the needle valve about 2 1/2 turn, choke and start.
STARTS BUT STOPS IMMEDIATELY	Engine not getting enough fuel	Check tank fuel level - If low add fuel. Open needle valve half turn and continue to the starting process.
	Not enough "Break-in" time	Open needle valve half turn and continue the starting process. Perform "Break-in" once more.
IRREGULAR ENGINE SOUND AND ROTATION	Loose Glow Plug	Replace old plug with a new one. Tighten plug with a wrench.
	Loose Engine or mounting bolts	Retighten all bolts on engine or mount.

good 'revolutions per minute' (rpm) with torque.

Four-stroke engines are now taking a foothold in practical model uses. Their main advantages are greater fuel economy, better torque, and much lower operating noise. The lack of a need for a muffler on these engines also make them ideal for use in scale models. Their disadvantages are higher initial cost, greater mechanical complexity, and lower rpm. They definitely have a place in practical modeling, and will continue to be refined by their manufacturers.

The fuel used in most model engines is a mixture of methyl alcohol, oil, and nitromethane. The methyl alcohol is the prime ingredient in combustion. The oil used can be castor oil, synthetic oil, or a mixture of the two for proper lubrication. Nitromethane is used to increase the power and operating temperature of the engine. Ignition is accomplished by a glow plug or a glow head. The plug or head contains a coil of wire that is brought to a cherry-red glow by applying the current from a battery across its terminals. Once the proper air-fuel mixture is reached during starting, the battery can be removed. The heat of combustion will keep the wire glowing until the next combustion cycle. There are other engines on the market that run on gasoline or alcohol alone with differnt operating principles, but these engines should be used only by experienced modelers.

B. Choosing an engine

As a beginner, you should stick to a simple single cylinder, two-stroke engine designated or provided with the model plane, boat, or car kit that you have chosen. Engine sizes are in fractions of a cubic inch. (For instance, an "049" engine is .049 cubic inches in displacement.) Engines are also designated in cubic centimeters. If you are given an engine size in cubic centimeters, divide that number by 16.39 to get the size in cubic inches. For instance, 3.5 cubic centimeters divided by 16.39 yields .21 cubic inches.

When buying a model engine, you should choose the size recommended by the kit manufacturer. If you use too small an engine, at least, the model will be disappointing in performance; and, at most, the model can be dangerous, such as an underpowered airplane struggling to get into the air. Using too big an engine is also bad. It can make the model uncontrollable or exceed the structural limitations of the model. Keep in mind that a reserve of power is okay, but excessive power is dangerous.

What accessories are necessary to start an engine? At least, you need: fuel, a glow plug or glow head that may or may not be supplied with the engine, a fuel pump, fuel tubing, a glow plug/prop wrench, an ignition battery, glow plug clips, a proper size propeller or load, and a "chicken stick" to turn the engine over. You need something to mount the engine onto while breaking it in and testing; an engine test stand is a good investment but don't use a vise to mount an engine! If econony is of absolute importance, you can break in the engine in the finished model. Electric starters, power panels, and field boxes with tools and spare parts can be acquired later as necessity dictates.

A big problem that will confront you as a beginning modeler is selecting the

type of fuel you should use to first start an engine. Here is a rule of thumb that you should follow: most engines, from .09 upwards, should be broken in using a fuel with at least 20% or more oil by volume and with 5% or less nitromethane. Engines smaller than .09 often use 15% or more nitromethane even while being broken in. Follow the engine manufacturer's recommendations when in doubt. If the fuel you are contemplating purchasing is not marked with the percentage of components, find out what they are from the retailer or from the fuel manufacturer themselves. If you use a fuel that has too little oil or too much nitromethane, the engine may not start or it can rapidly damage itself while running.

Glow plug sizes and types are sometimes confusing, but they shouldn't be. They come in two sizes (short or long) and in two types (radio control or standard). The short size glow plug is used in smaller engines, such as the Enya .09 and .15, while the long size glow plug is used in larger engines, such as the Enya .19 up to the .60. The standard type glow plug is used for constant speed engines, such as in U-control airplanes. The radio control (RC) glow plug has an addition to the coil, called an idle bar. The bar is usually below the coil. It prevents the fuel mixture from "splashing" into the coil at low speeds which would cool the coil off and stop the engine. Glow heads are a special combination of glow plug and cylinder head, often provided and used on smaller engines. Exact replacements can be obtained from your dealer or the manufacturer when the head burns out. Most glow plugs and heads are rated for 1.5 volt ignition batteries, so be careful that you have the right glow plug and battery for your engine! Once again, follow the manufacturer's recommendations for what plug size and type to use with your engine.

C. Start your engine

Having acquired the necessary items to start your engine, you can now proceed to break in your engine. Most model engines are now designed to operate at full capacity with a minimum of break-in time. However, you should break in the engine so it will operate reliably before you put your model through its paces. Before you do anything else, read all instructions and warnings provided with your engine, fuel, and accessories. If you fail to read and understand them, you may not be able to start your engine at the least, and at most you may injure yourself or others! Remember that model engines are part of a serious hobby, and are to be respected like any other

mechanical device. If you fulfill your responsibilities, you will enjoy easy, happy and safe operation of your model.

Secure your engine in the test stand or in your model. Be sure that all screws, fittings, and other items cannot come loose. You should break in the engine without a muffler. Fit the glow plug into the engine, if applicable. You should install the plug into the head by screwing it in by hand first, then by using a glow plug wrench to tighten it once it has caught the threads in the head properly. This is done to avoid stripping the threads in the cylinder head or plug. Be sure to use the washer provided with the glow plug; otherwise you may not be able to remove the glow plug later and the engine may leak around the glow plug. Select a balanced propeller and mount it on the engine. Ream it out if necessary just enough so the propeller fits snugly on the crankshaft. If it fits too loosely, it may shift off center and become unbalanced, possibly damaging the engine. Another tip is to mount the propeller so that one part of the blade points to the 3 o'clock position of rotation just as the engine reaches compression. You'll find that the engine is easier to crank over that way. Concerning airplanes, if the engine should stop in flight, you'll also find that this propeller mounting method will lead to fewer broken propellers in the dead-stick landing.

Fill the fuel tank with fuel and then connect the fuel line to the engine. Be sure that the air vent on the tank is open, so that the engine can draw fuel freely from the tank. Turn the main needle valve in all the way, then turn it out the recommended number of turns. You should prime the engine with a drop of fuel in the air intake and exhaust. With engines of the .049 size, you may need to prime the engine every time you attempt to start it. You should help the engine draw some fuel into the fuel line for easier starting. With the engine air intake fully open, put your finger over the intake and turn the propeller over a couple of times until you see a little bit of fuel drawn into the intake through the fuel line. Attach the glow plug clips to the battery, and then to the glow plug. Confirm that the connections are firm, and that the clips do not touch (short out) against each other. Take the chicken stick at this point and bring the propeller up to the 3 o'clock position. Now, turn the propeller through the compression point firmly and briskly. If you hear a popping sound, the engine is ready to start, so keep trying. If the engine fails to start, look over the checklist to remedy the problem.

to page 134

Here are a few additional tips once the engine has started. Make all adjustments from behind the engine. Don't reach over the propeller to make any adjustments! Remove the glow plug clips as soon as the engine is running. At this point, the engine should be running rich at full throttle. How can you tell the difference between a rich and a lean running engine? There are two ways; first, listen to the sound. A rich running engine will have a deep, "bubbly" sound while a lean running engine will sound like it is "screaming," with a high pitched whine. Second, a rich running engine will have much exhaust residue, while a lean running engine will have cleaner exhaust. How long should you run the engine? The most popular suggestion is that the engine should be run for 2 to 5 minutes each time and then shut it off to let it cool down. The whole idea of this break-in is to let the parts wear slightly to reach the proper operating tolerances in the engine. As the engine heats up, the metal parts expand and rub against each other, thus wearing themselves into tolerance. When the engine cools off, the parts shrink slightly. By alternating the on and off periods of engine running this way, break-in time is reduced. Don't be alarmed if you see a grey residue in the exhaust; this is nothing more than some of the metal that is to be worn off in the break-in process. On bronze bearing engines, you will see more of this residue than on ball bearing engines. On U-control engines, you should gradually lean the engine out. If the engine does not hold a high rpm setting, it is not fully broken in and should be run rich for a longer time. An R/C engine should be varied in speed between full and low rpm's by moving the throttle lever slowly. If the engine cannot hold the high speed setting without slowing down or stopping, it should be run rich a few more times. By the way, the safest ways to stop the engine when necessary are: pinching the fuel line, richening the mixture, or closing off the carburetor completely.

D. Mounting and Adjusting Your Engine in the Model

All model engines, regardless of how they are to be used, must be mounted firmly. An engine that is not mounted firmly will not run properly and will create damaging excessive vibration. Use mounting screws, or nuts and bolts of the correct size; and use all the holes drilled in the engine mounting lugs! You may find it helpful to use metal thread locking cement on the mounting screws or bolts to prevent them from loosening up from engine vibration.

Proper positioning of the fuel tank also helps the engine to operate correctly. The best position for the fuel tank often turns out to be with the midpart of the fuel tank at 1/2" below the fuel intake on the engine. If the fuel tank is too high, the engine will flood out. If the tank is mounted too far below the fuel intake on the engine, the engine may run too lean or not be able to pull up fuel at all. The fuel tank should be insulated against too much vibration. If the fuel tank is vibrated too much, the fuel will foam up and the engine will run too lean.

With R/C engines, a most confusing thing to do is to set an idle. It really shouldn't be; the idea is to get the lowest steady speed. The first step is to make sure the engine is broken in and that the high speed mixture is set first! On top of most carburetors, there is a screw that will adjust how far the throttle will close. With the throttle trim set "high" on your radio control system, and the throttle servo hooked up, move the throttle stick to the "low" position. At this point the engine should be idling. Adjust the screw on the engine and the throttle pushrod to get the lowest steady speed possible. If you want to shut off the engine without touching it, you should be able to do so at this point by moving the throttle trim from "high" to "low." However, don't let the servo jam up against the throttle stops. If the engine does not run too well at idle, there is another adjustment you can make. On some carburetors, there is a screw that covers a small hole in the front of the carburetor. It is called an air bleed screw. If the engine runs too slow and stops at idle, you should turn the screw out. This will allow the engine to run leaner at idle. If the engine runs too fast for an idle, make sure that you have properly adjusted the throttle rotation screw first. Then if it is okay, try turning the air bleed screw in to let the engine run richer at idle. On other carburetors, there is a disc that can be rotated to adjust the idle speed mixture. No matter what, read the engine set-up instructions first.

The use of mufflers should be a requirement wherever modelers gather for fun or competition. As a beginner, use the muffler provided or recommended by the engine manufacturer. Leave the "special mufflers" and tuned pipes alone until you become experienced in using your engine. Should you use fuel tank pressure? If not required by the engine, you can run the engine well without it. However, if a pressure tap is provided on the engine or muffler, don't be afraid to use it. The benefit is

that the engine will run more smoothly throughout the rpm range. Leave engine fuel pumps alone until you are more experienced.

In the special case of model airplane engines, you must be sure the engine is properly tuned before a take-off attempt. When the engine is tuned up at full throttle, hold the airplane firmly and point the nose of the airplane upwards at an angle of 45 degrees. If the engine "sags" or loses power, you should richen up the mixture slightly until it can hold a full speed setting. Now point the nose of the airplane downwards. If the engine slows down and stops, the mixture is too rich; so readjust it a little leaner. The final setting on the mixture should be set so that if the airplane is ascending or descending, the engine will not quit unexpectedly or lose power during the crucial take-off and landing periods.

E. Maintenance and Repair

Now that your engine is powering your favorite model, how do you keep it running well? After using your model, you should clean off any fuel residue or debris on your engine and model. The next thing you should do is clean the engine out, but you don't have to disassemble the engine to do so. Just use a solvent such as that used to strip off floor wax, or you can get an "after run" engine cleaner now sold by several model supply houses. Pour it through the glow plug hole and air intake. The reason for doing this is to remove alcohol from the engine, which draws moisture out of the air and can cause rust inside the engine. Also, the solvent or cleaner will remove gum and varnish from inside the engine. After the cleaning, oil the engine with a rust preventative oil such as gun oil or a specialty model oil.

These steps contribute to longer engine life. By not running your engine too lean and by taking care of your engine after a day's use, your

engine should last a few seasons of average use. What happens when your engine gets "tired" or damaged? You may want to repair or replace it.

Let's look at the possibilities.

(1) Repair the engine yourself? If the cost of parts is economical enough and the repair procedure easy, you could try it yourself and perhaps save some time and money. If you are unsure of yourself at any point, don't try it! Leave it to the experts then.

(2) Have a friend repair the engine? Every modeling fraternity seems to have an "engine man." He can be a good bet to repair your engine; however, be careful! A fellow who calls himself and "engine man" may only be a careless tinkerer. If he is the type who constantly fiddles with engines but can't get them to run right, he may do your engine more harm than good. A good "engine man" is able to get his engines to run right and for long periods without tinkering, and has a good reputation among modelers who have benefited from his workmanship.

(3) Have the manufacturer repair the engine? Most manufacturers will service what they sell at a reasonable cost. You can send the engine in for an estimate of repairs before authorizing the actual repair if you so wish.

(4) Replace the engine? If the cost of repairs exceeds the cost of a new engine, you should consider replacing your old engine. Another factor to consider is that the engine manufacturer may have come up with an improved version of your old engine, or may have discontinued manufacture of the old engine and parts entirely. The last factor is that if there is a sale on engines at your favorite hobby retailer, you may be able to replace your engine at a cost lower than repairing it. In some rare cases, you might be able to buy a new engine at a price lower than that of the old engine! If at any point your engine

to page 195

GIVE IT A WHIRL

John Gorham

Bill Curtis with his Competitor. Bill received a well-deserved "Dedicated Effort" award.

Tom Bigeley with his beautiful prize winning Kavan Jet Ranger.

Three different makes "rub shoulders" at Merced. KKK, Horizon and Kalt.

In my last column we discussed how inverted flight can be accomplished. I hope that it helped some of you get over that sometimes fearful experience of trying something new and that by now many of you have experienced the thrill of flying an R/C helicopter up-side down. Since that column got quite lengthy I had to delay discussing some of the fine points on "out of trim changes" between right way up and upside-down flying. So I will cover this later on in this column. First, however, let's get into some of the reports that have come in recently regarding various meetings and competitions.

Following the Nats and the East Coast Helicopter Contest, the last major U.S. contest of the year is the one put on by our old friend and veteran R/C helicopter flier, Bill Curtis. Bill was responsible for organizing and directing the early NRCHA competitions and last year he decided to resurrect these by holding the 1st Eastern United States Helicopter Championships in Greenville, Pennsylvania. Attendance was good last year and a little down this year. However, by early September, the average flier has done about as much traveling as he's able to afford and this is probably one of the main reasons for the slightly lower numbers at Bill's contest. However, the eastern U.S. Helicopter Championships still had around 40 entries this year. Bill's contests always consist of combination fun-fly and FAI events which provide a test for the expert and fun for all. Everyone had a good time — no photos, though, 'cos Bill says they didn't come out too well.

Another contest which just occurred is the 1983 Eurocup held by the

C.D. and "Codreamer" Chuck Winter shows he can fly too!

John Simone Sr. with his flight line of Mantis'.

Dave Robertson demo'ed his KKK Hughes 300.

Cliff Hiatt — fast "up and coming" new flier with his Hellboy.

Ewald Helm does some spectacular flying with his "Star Ranger."

Curtis Croker shows off "Supermantis."

Bretons Model Flying Club in England. You may remember we reported on this as an up-coming event several months ago so that you could attend if you wished. It seems not too many Americans were able to make the journey. Robert Gorham was poised to go but at the last minute he had to cancel out with much regret. However, just the telephoning and writing up to the point of the competition has made us many more "heli-nut" friends in England.

I'm sure one day we'll all get together in one great big meeting. Maybe at the FAI World Championships in 1985. Well, I've not yet received detailed results of the 1983 Eurocup competition which is one of the major FAI events held in Europe each year.

The winner of the FAI Expert event, however, was Ewald Heim flying his own design and make of helicopter, the Heim "Star Ranger." This machine is now becoming very popular in Europe. At a recent European meeting in Belgium, more than half the entries consisted of the Heim helicopter. Naturally, my curiosity was aroused and I invited Ewald Heim and his wife, Ida, to visit the USA to meet their American counterparts, to compare ideas, and fly each other's helicopters.

After Ewald accepted our invitation I wanted to invite a whole bunch of fliers to meet him and have fun for a couple of days. Then I realized that this was my chance to fulfill a dream which I've had for years and which I described in a "Give It A Whirl" column in 1983. I dreamed of a big grass field, beautiful weather and two days of just swapping notes, flying and enjoying the company of lots and lots of R/C helicopter fliers. No contests — so that you didn't have to keep worrying about when you had to fly next. Only a few simple, formal fun-fly events, too, for the same reason. Just some top fliers for us to watch, the opportunity for beginners to ask questions and get help and the chance to fly the other guy's helicopter.

Well, it happened! In Merced, California, on October 22 and 23, held on the athletic field of the Merced Community College. How it happened was that an old flying buddy, Chuck Winter, of the Merced County Radio Control Club had also been "dreaming" this way, too. We talked and then we got the leaflets going and the phone ringing. Chuck's club backed him all the way and Ewald Heim, the European champion; Bill Curtis and Robert Gorham, our own USA champion promised to attend. The outcome was nothing short of spectacular. Ninety eight helicopters

to page 144

on site and two days of relaxation and fun. But more, the idea seemed to appeal to lots of other notables, too, so we finished up with Ernie Huber, Walt Schoonard, Larry Jolly, Dave Robertson of "C.M.I.," John Simone of "American RC" with Curtis and George Croker, and many others. Jeff Sands and Ken Kershaw even came down from Denver to sample our "thicker" air.

All makes of helicopters were flown and many times there were four or more in the air at one time. Bill Curtis, Bob Hamilton and Robert Gorham did

Robert Gorham tries Cliff Hiatt's Heliboy.

Ernie Huber, Massachusetts, hovers his "Superior."

Dave Robertson shows his new KKK Robinson "Flybarless Head."

Robert Gorham shows Cliff Hiatt some features of the Hirobo SST Corvette.

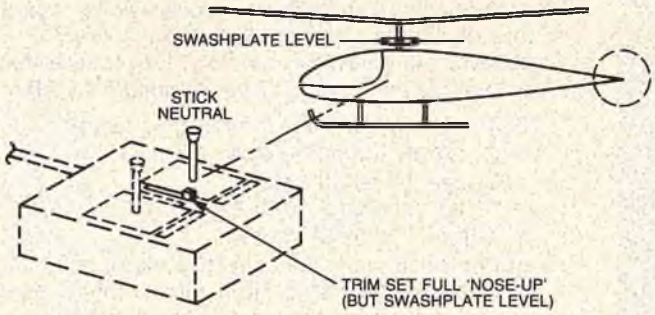


FIGURE 1
HELICOPTER TRIM OK IN 'RIGHT WAY UP' MODE

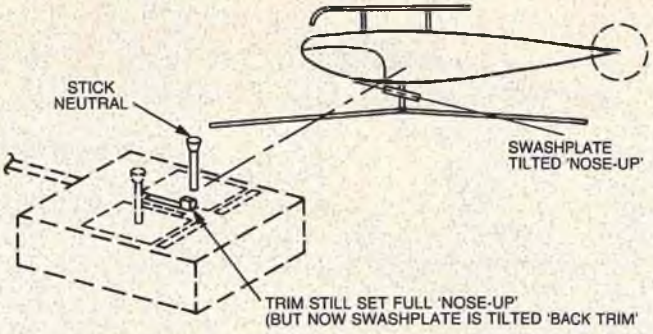


FIGURE 2
'OUT-OF-TRIM' HELICOPTER WHEN 'INVERT' MODE IS SELECTED

the three-at-a-time inverted hovering trick. Autorotations seemed to occur every two minutes and we even had a brief autorotation fun event which Robert won, followed closely by Bob Hamilton, Ewald Heim, Bill Krietzman and Jeff Sands. To give you an idea of the accuracies achieved, Robert and Bob had to have a "fly off" since they both hit the three foot diameter landing pad **three** times consecutively.

I had already decided to give a trophy for "dedicated effort" to our sport of R/C helicopter flying. We decided, at the meet, that this year it should be awarded to Bill Curtis. Bill has been flying since "whenever." He has flown and represented Kavan, Schluter and GMP helicopters, helped so very many beginners, done lots of "firsts" but, most important, has kept all this up despite two very serious and constantly painful spine and leg injuries. Bill, we all salute you.

Well, to summarize, everyone there said, "Let's do it again." So look for the 2nd West Coast R/C Helicopter Fly-In in 1984. The Merced County Radio Control Club did all of the organizing; I helped with ideas, trophies and publicity. The club is just like yours, so **you** could do it. The officers most active in the fly-in were Dawes Reyburn (President), Ron Silva (Vice President), Nancy Hladek (Secretary) Chuck Winter (Treasurer and C.D. of the fly-in), Ted Trindad and Ed Hladek (Field Directors). The MCRCC has seventy members, **mostly fixed wing** (but not anymore, we hope) and they have put on many annual air shows and fly-ins. Thanks, Chuck and gang — let's do it again, soon.

Now to the discussions on inverted flight and some more details on how important trim adjustments can be.

Inverted Flight Trim Adjustments

When we fly our helicopter only the right way up, it is quite common to off-set the trim levers to produce the in-trim condition that we want. We do not always reset our linkages so as to recenter the trim levers. It's good practice to do this but not necessary **if** we only fly right side up.

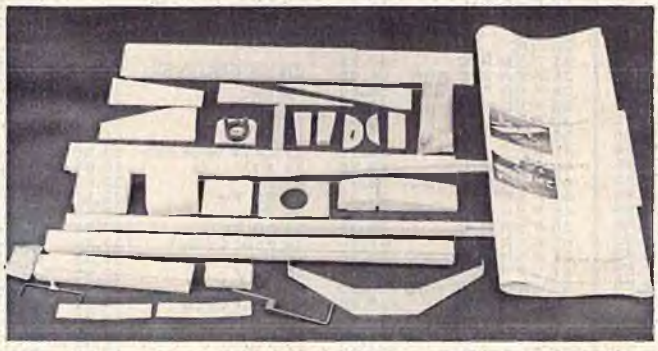
Figure 1 shows a condition in which we have set our swashplate level for stationary hover or slow, forward flight. But, in order to do this, the trim lever on the transmitter has been set to a fully forward position. Now what we **should** do **before** our next flight is to move the trim lever back to center and then readjust the rods and linkages so that the swashplate is level again, with the trim levers now centered. But now consider inverted flight. If you look at Figure 2 you'll see the forward trim lever position, which resulted in well-trimmed flight the right way up, will now cause the swashplate to tilt back when the invert switch is "flipped." This is because the little electronic men inside the transmitter receiver have been all running up hill to keep the swashplate level because the trim position told them to. Now, when the invert mode is selected, they have to run in the opposite direction to "balance things out." They didn't know, of course, that everything was fine with the trim lever fully forward in forward flight and what they really should have done was not change the swashplate position when upside down. However, they tilted the swashplate back. Now, when you go into inverted flight you will have a considerable amount of "nose up" which you will not be able to trim out on the trim lever since it's already in the fully forward position. So you see, one important factor of inverted flight is to have your trims set physically in the neutral position when the helicopter swashplate is level and then, when you go to the inverted flight position by moving the switch on the transmitter, there will be no movement of the swashplate. If you will think about this a little more, you will also realize that you can achieve different trim arrangements upside down from those the right way up, purely by juggling with the position of your trim lever relative to the tilt of your swashplate. To further complicate things, the position of the CG of the helicopter will, of course, affect this whole thing, too. The final results can only be resolved by the flier himself setting the trims to cover both "right way up" and inverted flight to best avoid having to make manual trim lever changes while flying.

I hope that the foregoing has given you a little food for thought. I just realized that this will be the last "Give

to page 195

RCM PRODUCT REVIEW

Buzz Waltz R/C Designs
BEGIN-AIR TRAINER



SPECIFICATIONS

Name	BEGIN-AIR TRAINER
Aircraft Type	Trainer
Manufactured By	Buzz Waltz R/C Designs 403 Industrial Place Palm Springs California 92262
Mfg. Suggested Retail Price	$39.95
Available From	Both Mfg. and Retail
Wingspan	55 Inches
Wing Chord	10½ Inches
Total Wing Area	577.5 Sq. In.
Fuselage Length	41 Inches
Stabilizer Span	21 Inches
Total Stab Area	105 Sq. In.
Recommended Engine Range	.20-.25
Recommend Fuel Tank Size	4 Oz.
Recommended No. of Channels	3 (4 w/opt. Ail.)
Rec. Control Functions	Rud., Elev., Throt. (Ail. opt.)
Basic Materials Used In Construction:	
Fuselage	Plywood & Balsa
Wing	Balsa and Plywood
Tail Surfaces	Balsa
Building Instructions On Plan Sheets	Yes
Instruction Manual	Yes (21 pages)
Construction Photos	No (2 plan sizes pgs. of 3-D dwgs.)

RCM PROTOTYPE

Radio Used	Kraft
Engine Make & Disp.	O.S. .25 FSR
Tank Size Used	4 Oz. Sullivan
Weight, Ready to Fly	64 Oz.
Wing Loading	16 Oz./Sq. Ft.

SUMMARY

WE LIKED THE:
Instructions, plans, quality and design.
WE DIDN'T LIKE THE:
No problems encountered.

We were introduced to the Begin-Air Trainer by a friend who had built and was flying one of these very neat planes. By the way, he is an experienced builder and flier. Once you set eyes on this plane, it is irresistible; we caved in and placed our order post haste. Upon receipt, it was discovered that the kit really was designed for the beginning modeler. It had one of the most complete set of instructions we have seen in a long time.

Because summer plans would take us away from the workshop for a relatively long span of time, it was decided to set forth a task for ourselves. The task would be to build the plane under the same circumstances that a rank beginner would find himself. We were to be away from all the power tools and special purpose tools. We packed the kit in a larger box, included a radio, X-Acto knife and extra blades, a few small hand tools, some glue and sandpaper. We were able to put together a building surface that would accommodate a whole sheet of plans.

The first thing we noticed when we opened the kit was that the plans were rolled, this always elevates the manufacturer in our mind. Nothing in the kit was die-cut, everything was sawed and sanded. For example, the wing ribs were all exactly the same shape, the spar notches exactly the same size and all other balsa parts were just as neat. The hardware and small balsa and ply pieces were enclosed in plastic bags to minimize being scattered all over the box.

Construction:

When we unrolled the plans we found four sheets, each of which measured 24" x 43". Two of the sheets were the normal set of plans, one featured the tail surfaces and fuselage, the other the wing halves. The other sheets were step-by-step drawings of the fuselage and wing construction. These two sheets were pinned to the wall in the working space for easy referral as most steps in the instructions called out reference to the drawings. We like this unique feature of the kit very much.

The 21 page instruction book, in extra large type, was set up in a step-by-step format. Almost every step referred to the three dimensional drawings on the extra plan set. As each step progressed, the drawings progressed until you have completed a part of the plane. We feel these instructions, together with the drawings, make one of the better instruction manuals we have run into in a long time.

While working on the wing, we ran into the first problem that is going to challenge the beginner. Not only is the top of the leading edge well-rounded, so is the bottom; that is a lot of balsa wood to remove. The normal procedure is to reach into the drawer, remove the small hand plane, and set to peeling away the balsa wood in neat beautiful curls. The plane was back home so we had to settle for using sandpaper. We used 2" x 9" boards of 1/4" ply, contact cement and sandpaper to make the finest sanding blocks going. Why 9" long? That is the width of ordinary sandpaper, just cut a 2" strip from the sandpaper, cement it

to the board and you can even put a different grade on the reverse side. Be sure to have one board with No. 80 grade sandpaper, that one can hog out balsa almost as fast as a plane. Follow with 100, 120, 240 grits.

The instructions indicated you should glue the shear webbing between the spars. We deviated slightly and glued the sheer webbing to the bottom spar then glued the top spar in place. The webbing was individually cut and sanded to size, all you had to do was cut a tad off the length and they fit perfectly.

Another thing we appreciated was that all the spars and wing sheeting were cut to length; we feel this is much better than having to cut all pieces from 36" standard stock. The instructions indicate you should bevel the center ribs in accordance with the ply dihedral braces. This is not quite enough to get the 1¾" under each wing tip as called out in the dihedral instructions. If you are going to fly the plane without ailerons, the indicated dihedrai is absolutely necessary.

The fuselage was not particularly difficult to construct, however, do not install the last 3" of the 3/32" sheeting until the very last. We even covered the rest of the fuselage before adding this part. You cannot get to the elevator horn with this sheeting in place. The elevator must be finished, covered and installed, the pushrod hooked up then add the top sheeting, cover, then add fin and rudder.

Covering:

The RCM Begin-Air Trainer prototype was covered with Super MonoKote, the trim was a combination of Goldberg Color Stripe and MonoKote trim sheet. The white was put on first, then the red, the black was cut to shape and installed over the red and white. To avoid bubbles, do not allow the black to overlap more than 1/8" or so.

Engine:

We used an O.S. .25 FSR and a Sullivan RST 4 oz. tank. This engine was found to be more than enough power and, for the beginner, we would recommend either an O.S. .20 or .25, with muffler of course.

Radio:

A Kraft KP7C MK IV radio was used with four KPS 24 servos. The large cabin allowed the rudder, elevator and throttle servos to be mounted in a tray. There was more than enough room for the wing servo to occupy the upper portion of the radio compartment. The battery was mounted flush against the front former with the receiver directly behind. This was enough mass forward of the C.G. so no lead was needed.

Flying:

We cannot caution you strongly enough to do a complete field check of your whole plane before flying and, particularly so, the first time. **Check everything carefully!**

We who have built a great number of planes have intuition when we taxi out onto the field. This day was a day of good feelings, we just knew this little beauty would fly perfectly. Sure enough when we hit full throttle, she tracked a straight line down the runway, her wheels kind of kissing the top of the grass. A tentative bounce over a rough spot put her into the air. The full power of the O.S. .25 FSR lifted her way up into the blue, and a tiny bit of down elevator helped her to maintain a straight and level flight path. After a few turns around the field, flying comfort was quickly attained and our flying buddy insisted upon his turn. He did the unexpected — loops, 4 point rolls, Immelmans, and Split S's. As he continued, we became quite pleased. On the next flight we put her through a series of stunts then throttled back to less than 1/4 throttle just to see what would happen. She slowed almost to a crawl and stayed up there flying around in lazy circles. Every

to page 192

By Dick Tichenor

Dressed in Blue Angels colors, Bob Campbell's C-130 Hercules is being prepared for its maiden flight.

BOB CAMPBELL DOES IT AGAIN

A C-130 Hercules Follows The B-29

In the March, 1983 issue of RCM was an article entitled, "The B-29 With The Right Stuff" by Ken Willard. It described Bob Campbell's participation in the movie, "The Right Stuff," with his B-29 model.

The take-off roll begins.

The Hercules is airborne!

Bob selected the Lockheed C-130 Hercules as an encore. We received the following from Bob:

Dick:

Flew the C-130 on Sunday October 30th. It flies great. Flew it at Shelly Airport on a 3500 feet asphalt strip.

Take-off was smooth rolled 75 feet and nose gear came off; another 100 feet and it gently lifted into the air. It flies faster than the B-29 on the same engines, 2.4 Kioritz, 4 blade 20/8 props cut down to 18. They turn 5400 each. It handles much better than the B-29. It is very responsive on all controls and turns on ailerons only like a pattern ship. It flew about a 10 minute flight.

The landing was super --- main gear first, then nose gear came down. All in all a picture perfect flight.

Most amazingly, it needed no trim changes at all. What an airplane. I spent two days in Pensacola with the Blue Angels and got some good shots. I have not received the Navy photos yet but will forward these as soon as I get them.

More later!

Sincerely,
Bob Campbell

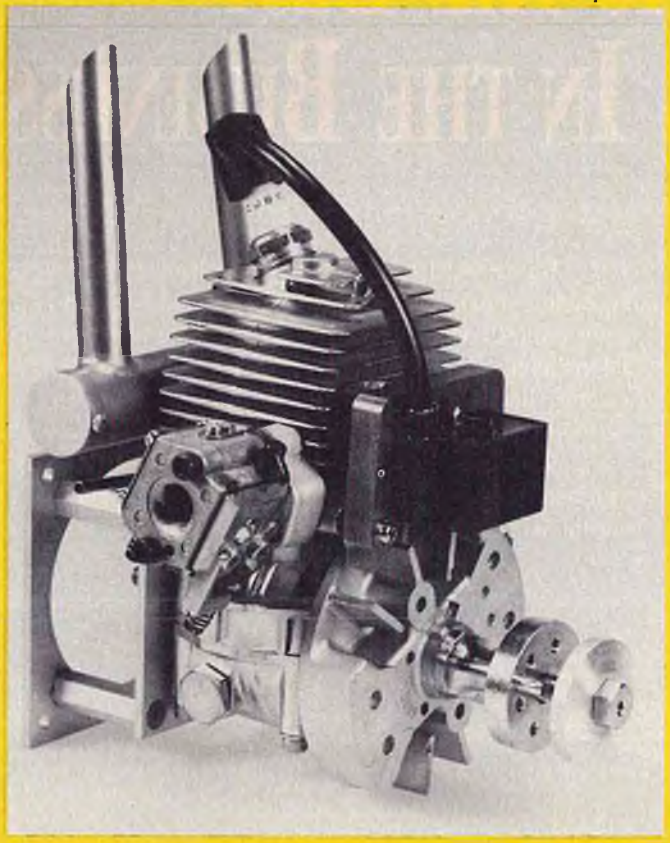
Congratulations Bob! Bob Campbell operates R/C Mfg., 706 Easton N.E., North Canton, Ohio 44721. □

Four turning and C-130 accelerates.

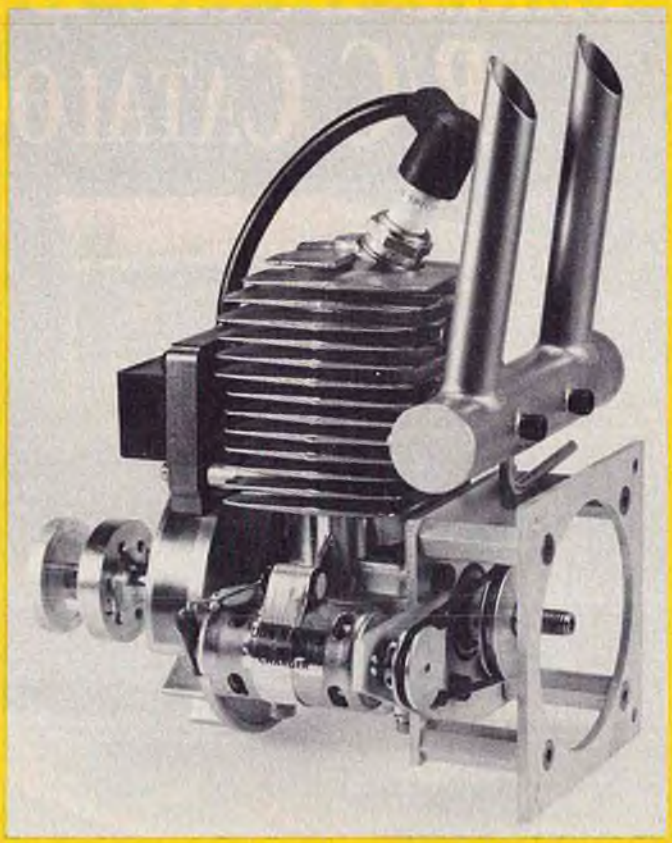
Rotation and lift-off.

ZENOAH G-38 QUARTZ ENGINE

By Clarence Lee



Front right view of the Zenoah G-38 Quartz 2.28 c.i.d. engine.

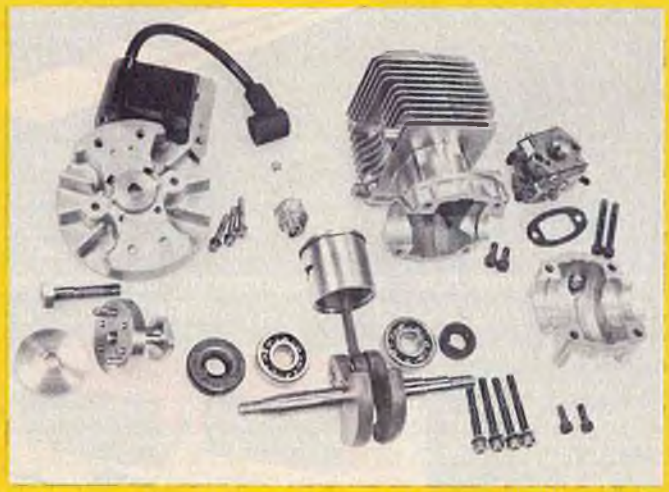


Left rear view of the G-38 Quartz shows the Don Harris accessories installed.

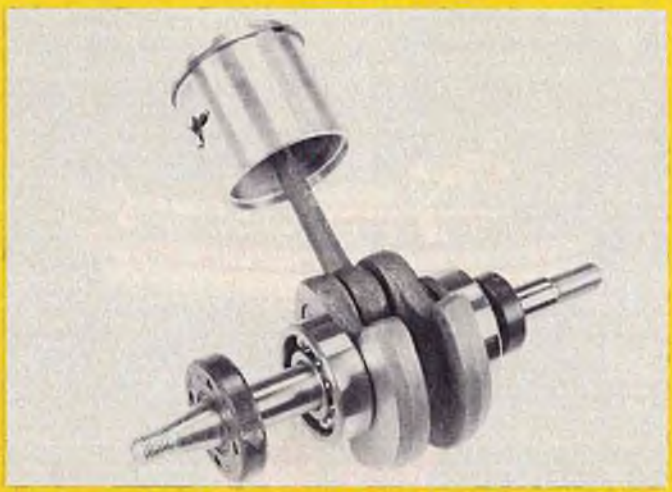
Long time readers of the Engine Clinic column will know that it has not been my policy to do engine reviews unless I feel that the engine is of a different nature, has something better to offer in the way of quality or design, or is a lesser known engine of good quality that has not been brought to the attention of R/C modelers.

This past month several new engines have made their appearance on the hobby market that I felt should be brought to reader's attention. Unfortunately, I can't cover all of the new products that I would like to in one month in the Engine Clinic column. To speed things along and tell you about some of these new products while they are still new, I would like to give you a new product review in addition to the regular Engine Clinic column this month.

Don Harris, best known for his smoke generating mufflers and on-board charging system, sent me one of the new Zenoah G-38 Quartz



Parts break-down of the G-38 Quartz (shown without the Don Harris accessories).



Ball bearings and crankshaft seals are shown in their respective locations. Connecting rod uses needle bearings on upper and lower ends.

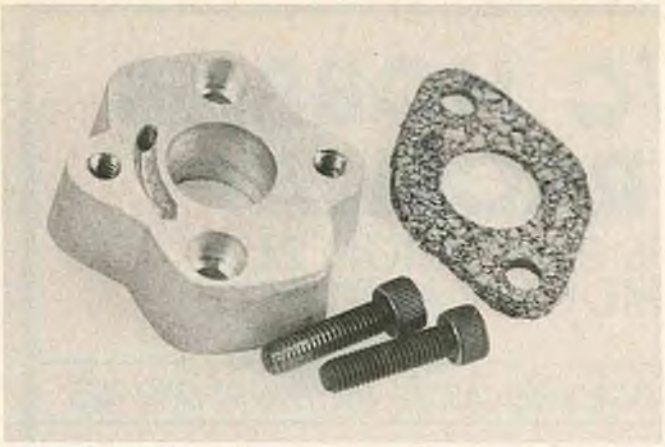
2.28 cu. in. engines being imported by John Maloney of World Engines. Don, who was one of the pioneers of giant scale models, felt the Zenoah was an exceptionally fine engine at a real bargain price and offered many features not found in many of the other "chain saw" type engines. After running and inspecting the engine, I have to agree with Don's evaluation.

This will be the first engine intended for giant scale use since our review of the Kawasaki that I felt merited a review such as this. There have been a large number of chain saw and leaf blower type engines modified for giant scale use available but, up until now, the Kawasaki and Kioritz were the only two I would consider using myself. With all due respect to the Quadra which more or less pioneered the giant scale engine field and is a good engine for the price, it did leave much to be desired in many areas. I will say that there has been considerable improvement in the engine since its original introduction.

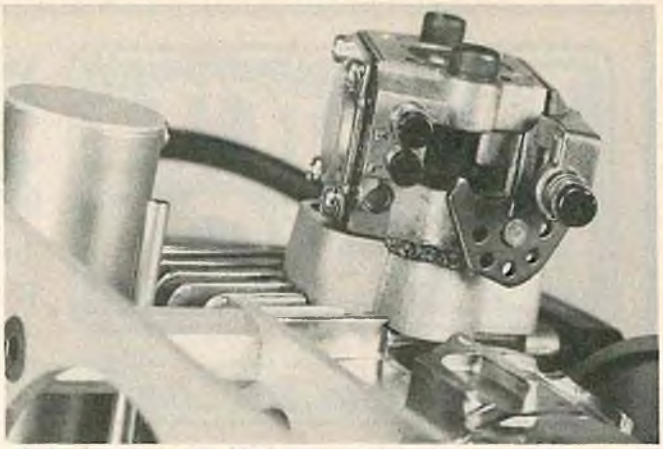
Those of you who read the magazine advertisements have probably noticed the World Engines ad for the Zenoah G-38 Quartz engine and, like myself, thought here was just another modified chain saw engine now being imported by World Engines. While this may be basically true, the Zenoah is head and shoulders above the rest of the pack in the 2.3 cu. in. displacement size, with the exclusion of the Kawasaki which sells for a considerably higher price.

The Zenoah G-38 Quartz is a 2.28 cu. in. displacement two stroke spark ignition gasoline engine manufactured by the Komatsu Zenoah Co. in Tokyo, Japan. For those of you who have not read John Maloney's World Engines ad, the Komatsu Zenoah Co. has been in business since World War I. They employ approximately 1000 people and have manufactured full size aircraft engines as well as engines for the Ultra-light aircraft. Zenoah is now working with World Engines to adapt some of their smaller engines for model aircraft use. The first engine will be the G-38 Quartz which will soon be followed by a smaller G-23 of 1.37 cu. in. displacement. The G-38 and G-23 designations being the displacement in cubic centimeters. Actual displacement of G-38 is 37.5cc (2.28 cu. in.) and the G-23 22.5cc (1.37 cu. in.).

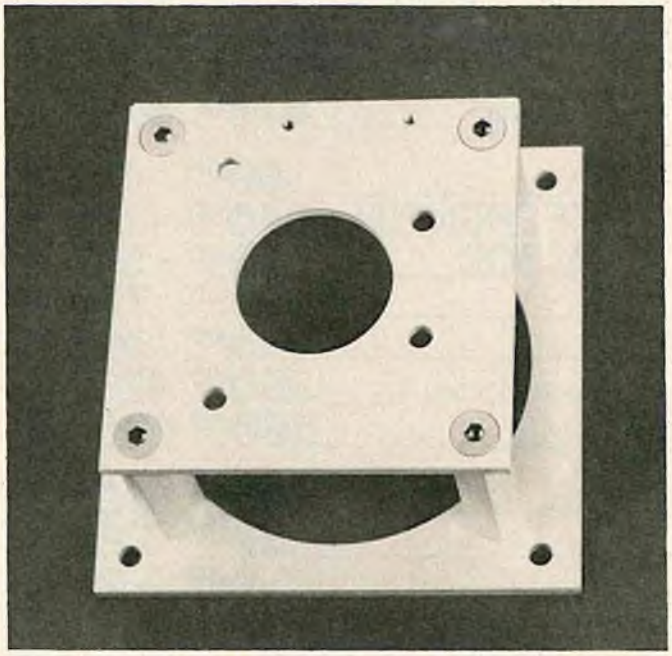
With a bore of 38mm and stroke of 33mm (1.496" x 1.299") the engine would be considered of "over square" design. The engine is of Schnuerle port design and uses piston port induction. This is a combination of present day technology with the Schnuerle porting and very old technology with the



Don Harris carburetor adapter rotates carb for ease in control installation.



This view shows throttle control relocated for straight forward pushrod installation.



The Don Harris engine mount allows good load distribution and convenient installation.

The muffler/exhaust manifold shows the pre-heating coil for the smoke generating system. A Don Harris accessory.

piston port type of intake. This is the same method of intake induction as used on many of your very first model engines — Brown Jr., Ohlsson Miniature, etc. Due to its simplicity, most all of your chain saw and leaf blower type engines use either the piston port induction or reed valve induction. Both have their advantages and disadvantages. Perhaps a little explanation of these two types of induction is in order here.

With piston port induction, the bottom edge of the piston uncovers the intake port on the upstroke and closes the port on the downstroke. This means that if the piston uncovers the intake port 65° before top center it, in turn, closes the port 65° after top center for a total intake duration of 130°. 65°-65° being the actual intake timing of the Zenoah. With reed valve induction, a flapper valve, usually made of spring steel or bronze, nylon, or fiberglass, is placed in the intake system coupled directly to the crankcase pressure. As the piston starts its upstroke the valve opens, and as the piston passes top center and starts its downstroke the valve closes. Piston port induction has the advantage of no moving parts but the late closing timing, in order to get an equal opening time and fairly long intake duration, can result in a lot of blow back at the carburetor. However, this was not the case with the Zenoah. Even though the engine has a very late closing timing, there was no blow

to page 164

back at the carburetor. That is, no spitting of fuel out the carburetor intake that is common with many of your other chain saw type engines.

Reed valve induction more or less supplies fuel mixture in relation to the engine's demand. The reed valve opens earlier and closes sooner and generally there will be less spitting of fuel out the carburetor. However, you do have the obstruction of the reed valve in the intake tract and additional moving parts. At higher rpm, reed valves can start to flutter but this is not usually a problem with the chain saw type motors that are seldom operated over 8,000-9,000 rpm.

Many of you have probably wondered why crankshaft induction, as used on most of our regular model engines, is not used. This would actually be the most efficient method as the opening and closing timings can be controlled and a longer intake duration can be achieved. That is, by opening the crankshaft intake port at 35°, after bottom center (145° before top center), and closing the intake at 45°, after top center a total intake duration of 190° can be had. In the case of a racing engine, even later closing timing is used. However, in the case of the chain saw type engines, a considerably larger crankshaft would be required which would add to the weight and cost. Since the chain saw type engines are low rpm engines, a little efficiency is sacrificed for the sake of simplicity, easier manufacturing, and cost.

With that out of the way, let's get on with some of the features of the Zenoah that make it a better engine.

The crankshaft is of the double counter balanced type. As can be seen in the accompanying photographs, there is a large counter weight on either side of the connecting rod. Many of your other chain saw type engines use only a single counter weight which is not sufficient and have to resort to adding weight to the magneto flywheel in an attempt to smooth the engine out. The Zenoah, with ample counter balance built into the engine, is very smooth at both the low and high speed. It is impossible to fully balance a single cylinder two stroke engine at all rpm ranges so there is a little roughness in the 4,000 rpm range. Not enough to be the cause of any concern, however. The crankshaft rides on two ball bearings, one either side of each counter balance. To seal the crankcase, a neoprene or some type of rubber seal is used on either side of the bearings. Ball bearings are a desirable feature on the crankshaft as they can take both radial and axial loads. This means they can also take the thrust load of the propeller. Many chain saw type engines use roller bearings without provision for thrust loads. Chain saws do not require a thrust load type bearing. When adapted to aircraft use, a bronze washer is used to take the thrust load of the propeller. Needless to say a ball bearing is the better way to go.

The connecting rod is a steel forging and uses needle bearings at both the crank pin and wrist pin ends. The piston is machined from an aluminum die casting and uses a single pinned ring. By pinning the ring it cannot rotate and have one of the ends catch in one of the intake or exhaust ports. This also elminates ring end "beveling" caused by the ends of the ring passing over an intake or exhaust port and minutely catching. An added advantage to a pinned ring is its "wearing in" and "seating to" the cylinder wall providing a better compression seal. The ring wears in and matches any irregularity in the cylinder bore. That is, if the cylinder should expand slightly out of round during operating conditions, the ring also takes on this shape.

The piston runs in the chrome plated aluminum cylinder and a separate steel sleeve is not used. This is pretty standard practice among the chain saw engine manufacturers. Although a separate steel sleeve might be desirable the direct chrome plating of the cylinder does save considerable weight. Of course, if you do score the cylinder you have to replace the whole casting.

The Zenoah uses a capacitive discharge magneto type of ignition. This means no mechanical points are used and the spark plug is fired electronically. The magneto used is extremely efficient in that rotating the flywheel magnets past the coil segments fast with your fingers with the spark plug removed will result in firing of the plug. This is very important if an engine is to be easy starting. I found the Zenoah to be very easy starting. When cold, a finger over the intake and one flip of the prop to draw fuel to the carburetor — 2 more rotations of the prop holding on to it so that the engine will not fire to get fuel into the cylinder — and a final flip had the engine running every time. When hot it would start with only one or two flips of the prop every time. This is one of the easiest starting chain saw type motors I have ever run. Much of this is due to the excellent compression and hot spark provided by the magneto.

In a personal note from Don that accompanied the engine he made mention that the engine had an automatic 28° spark advance. As there were no moving parts in the magneto I was a bit puzzled as to how this 28° spark advance could take place. Curiosity getting the better of me I decided to check this out. Top dead center of the piston travel was located and a mark placed on the magneto flywheel. Other marks were made in 10° increments and a pointer attached to the crankcase and aligned with the top dead center (TDC) mark. The engine was started and, with the aid of an automotive inductive pick up timing light, the exact spark firing of the engine checked the same as with an automobile engine. From 1500 rpm through 5000 rpm the timing set right at 28°. 5000 rpm is the maximum limit

for my timing light; above this the light will no longer flash. Unless above 5000 rpm there is additional advance, I would say rather than automatic spark advance, the timing is pre-set at 28°. Unless, of course, an electronic component in the magneto of the engine I tested was not working properly and the engine was staying permanently at the 28° advance figure.

Proper spark lead (advance) is very important if an engine is to develop its full power potential. As a comparison, prior to our present day "smog" engines, automobile engines would have an initial pre-set advance of 12°-16° plus an additonal 18°-22° brought in by the centrifugal advance system as the engine rpm was increased for a total of 34°. In some instances a little more and, in others, a little less depending upon the application. With smog equipment and lower octane gasoline many "smog" engines are running with about 28° spark advance. The only problem with too much initial advance is the tendency for the engine to kick back when starting. The 28° used by Zenoah is just about maximum for a model engine.

Carburetion for the Zenoah is supplied by a Walbro pump carburetor. The Walbro seems to pretty well be standard equipment on most of the Japanese chain saw engines. Being of Japanese manufacture, this is understandable.

The manufacturer lists the serviceable engine speed of the engine as 7000-9000 rpm with a horsepower rating of 2.1 hp at 8000-8500 rpm. Don Harris had recommended the 18/8 Zinger as the best prop for the engine so this is the prop I used for running. Don had also said they were getting between 7800 and 8000 rpm with the 18/8 Zinger. This test engine had been run previously but I do not know for how long. I gave it an additional 15 minutes before checking the rpm. I tached the engine at just a hair under 8000 rpm and imagine this figure would be higher after several hours of running time. This was verified upon later disassembly of the engine showing the ring was a long way from being fully seated and broken-in. This is really a strong engine turning 1000 rpm higher than the Quadra with the same prop. As mentioned previously, starting was very easy, vibration level was very low and the engine would maintain an 1800 rpm idle with no fuel spitting out the carburetor. Very important when using gasoline fuel. Some of these giant scale aircraft fires could well have been caused by accumulation of fuel in the aircraft due to excess fuel spittage out the carburetor.

For fuel, Don recommended a 16-1 gas/oil mix for break-in and 32-1 after break-in. Don also recommended Homelite oil. For my own testing I was unable to locate Homelite oil locally so substituted Amsoil synthetic two cycle oil. This is one of the 100-1 oils but I mixed it 16-1 as per Don's recommendation.

The Zenoah G-38 is available from World Engines and their dealers. Don Harris is selling his special version of the engine and is the engine I tested. Don gives the engine a "class" touch by giving it a bead blasted finish. This also normalizes the aluminum and relieves casting stresses. For this base engine Don charges $115.00. Don also offers an engine mount fabricated from 6061-T6 aluminum for $25.00, a special carburetor adapter that allows direct connection to the carburetor without an additonal bellcrank as is required on the stock engine for $20.00, and, of course, his Smoke Generating Muffler system for $49.95. And, incidentally, Don's Smoke Generating Muffler actually has a tuned effect giving a slight addition to the power of the engine. The complete package price for the engine, mount, carburetor adapter, and Smoke Generating Muffler is $209.95. I should point out that the carburetor adaptor, by changing the position of the carburetor, does require modification to the carburetor and will not work with a stock carburetor. World Engines lists the weight of the engine as 4 lbs. 2 oz. The engine with Don Harris' mount, muffler, and carburetor adapter weighs 4 lbs. 12 oz.

Before closing this review, there is one other item that has been produced by Don Harris. That is an onboard charging system for your airborne battery packs. This consists of a small generator, a voltage regulator, and a tiny ammeter that is mounted in the aircraft cockpit. When I first saw one of these units I thought it was one of the greatest new developments for the R/C modeler to come along in a long time. There would be any number of uses for a product such as this but the main one would be to keep your airborne battery packs fully charged. Don's system used two battery packs so that if one failed you had a back-up system. Excluding pilot error, failure of the battery pack is the second largest cause of aircraft crashes. Sometimes just plain flying longer than the battery's capacity is also the cause of many crashes. For some reason, however, this neat product has not met with the modeler's enthusiasm that Don had expected, or myself for that matter. Possibly it is just a matter of fellows not knowing of the availability. Whatever the case, Don has discontinued manufacture of his onboard charging system. When the few in stock are gone there will be no more. Production costs have exceeded sales profit so it is no longer practical for Don to continue production. If interested in one of these systems, contact Don since the few he has left will not be available for long. Don's address is — Don Harris Model Products, 23668 Shadow Dr., Auburn, California 95603.

□

PRIMARY FLIGHT TRAINING COURSE FOR CLUBS PART I

By Don Sobbe

Once upon a time a group of modelers got together and formed a club. They obtained the use of a field to fly on. And everything was fine. Soon their activities attracted new modelers to join the club. And everything was fine. Then, more new modelers joined the club. And everything was **not** *fine. Transmitters were left on. Airplanes flew through the pit area. Fliers wandered all over the field unaware that they might not have enough life insurance. The planting of balsa trees became a daily ritual. Something was wrong in paradise. Everyone blamed everyone else. "We have to do something," cried the members at the next club meeting. "What we need is an instructor to teach these new guys how to fly." A call went out for volunteers and several members responded. At last, the problem was solved! Time passed. The club instructors taught new members to fly. But transmitters were still left on, airplanes still strafed the pit area and, at the end of the day, the garbage can was always full of models. And everyone lived unhappily ever after.*

This story is not fiction. Nor is it uncommon. I have seen it played out in several clubs. Always the same way. Always with the same results. Is it the fault of the club members? I doubt that. They care enough to recognize that there is a problem and complain about it. Is it the fault of the club officers? No, they attempt to cure the problem by getting members to act as instructors. Ah! Then it's the fault of the instructors! Close. But no cigar. If there is any fault involved, it is simply that everyone has failed to recognize the **cause** of the problem. Let me explain.

If you went to the local airport and wanted to learn how to fly, would they ask for a **volunteer** to teach you? Does model fuel taste good? No! You would

STUDENT LOG

Name _____

AMA No. _____

Date	Lesson No.	Instructor's Name	Comments And Recommendations

find yourself in the hands of a United States Federal Aviation Agency, certified, inspected, dejected, rejected, tested, approved and stamped all over, **Flight Instructor!** He would have books, charts, graphs, logs, keys to the airplane, know where the washroom is **and,** most important, he would have a training syllabus which contains his lesson plans. He would be **organized.** And that is the one big advantage that the poor club instructor doesn't have! In most cases the instructor has only his memory to guide him and little things like frequency control and field rules become insignificant when his student is doing his best to commit manslaughter with a model airplane. Learning just can't take place when two people are in that state of anxiety. Sure, the student eventually learns to fly. But that, in most cases, is all he learns. He doesn't know the club rule about flying through the outhouse while it's occupied. Even worse, he doesn't know why it is a rule until he is in the outhouse. Then he gets mad! Got the picture?

So. What to do about it. Get **organized!**

Whether an instructor is teaching full size or model flying, he is faced with the same problem. He must teach a tremendous amount of information to the student in a format that will enable the student to gain insight and understanding at the same time the student is learning new skills. All of this must be taught in a progression that will have meaning to the student and be remembered. That's the trick! You can't start in the middle and work toward both ends. You need a plan that will not only assist the instructor in teaching a newcomer how to fly but, fly safely with a basic understanding of his equipment and its limitations. If your club instructor can do that he will turn out fliers that everyone in the club can be proud of and enjoy as fellow club members.

Several months ago I began to see the signs and symptoms of the story at the beginning of this article in the club that I belong to. (Name withheld to protect the accidents looking for a place to happen.) With many years of modeling and several years as an instrument flight instructor to draw on, I decided to take a crack at writing a primary flight training syllabus tailored specifically for R/C. The club agreed to give it a try and what follows was the result.

The student manual was designed to give a newcomer to R/C an idea of what the course is all about. The instructor's manual contains eleven lessons in outline form which he can use as a guide in teaching. If there is a weak spot in this syllabus, this is it. In order for an instructor to be effective, he must not only understand this material, but, he must also be able to explain and demonstrate all of it. If he can't do that, he has no business teaching it to someone else. And that, club officers, is the criteria you can use in selecting your instructors. Once you find such a person, pay his dues! He's worth his weight in back issues of RCM.

Primary Flight Training Handbook And Student Pilot's Log

The function of this handbook is to provide you with an outline to the basic knowledge and skills that your instructor will teach you at the flying field. The purpose of this flight training course is not only to teach you to fly, but to teach you to fly safely with a basic understanding of your equipment and its limitations. This course is designed to provide an organized and progressive series of lessons that will enable you to gain insight and understanding in easy steps so that by the time you are ready to solo, it will be just another flight in the course because you will be prepared for it.

How long is this course? That's entirely up to you. I've seen some

people solo in one day while others take months. People learn at different rates and it has nothing to do with whether or not they will become good fliers. It's just human nature. If your model and radio are in proper working order every time you have a lesson, you will not waste any time at the field and should progress rapidly. Don't be afraid to ask for help. At one time every club member was a beginner and knows that you will have questions and problems. They're more than willing to help. And don't worry about how long it will take to solo. Worry about how well you learn before you solo.

The following contains a summary of what your instructor will be teaching you in each lesson. If your progress and time permits, several lessons may be combined in one flying session. By the time you finish this course, you will be armed with the basic knowledge and skills to become a responsible and safe flier who we will all be proud of and enjoy as a fellow club member. And you'll crash a lot less. If you choose to go it alone, you may become a responsible and safe flier, but the odds are that you will become a hazard to yourself and everyone else. It's up to you.

The last page of this handbook contains a log which you should have filled out by your instructor after each lesson. This will enable the next instructor to know what lesson you are working on and what areas need review. No time will be wasted and no part of the course missed.

Lesson 1: Aircraft Familiarization

In this first lesson, your instructor will show you how to pre-flight your model and identify any deficiencies that could cause a malfunction (crash) or safety hazard. He will also teach you how to start and adjust the engine.

Lesson 2: Radio and Field Procedures

This lesson will consist of acquainting you with your radio, normal and abnormal operation, interference and conducting a range check. Your instructor will also explain the field facilities for the models and radios along with field procedures and field rules for safe operation.

Lesson 3: Flight Familiarization

During this lesson your instructor will fly your model to verify its airworthiness and handling qualities. He will then explain the controls and what kinds of reactions you can expect from them. He will have you take the controls after the model is at a safe altitude. Don't worry about losing control during this flight. That's what the instructor is there for. He will keep you out of trouble. Just relax and get

to page 172

the feel of the controls. If you get nervous, which happens occasionally, tell your instructor and he will take the controls. Remember, all you want to do during this lesson is get the feel of flying the model.

Lesson 4: Flight Maneuvers

After you have gotten the feel of flying your model, your instructor will teach you the five basic maneuvers required to get around the sky. They are:

1. Level flight
2. Banked turns
3. Straight climbs
4. Climbing turns
5. Gliding

Your instructor will also explain disorientation. This is a problem that everyone experiences sooner or later in flying models. Basically, disorientation occurs when the model does something your senses don't anticipate. For example, when the model is coming toward you and you start a left turn, the model will turn to the left. But it will move to your right. Your hands have told your brain: Left; but your eyes are telling your brain: Right. Result — disorientation. Experience will teach you how to respond to this problem. It's like learning to balance when riding a bicycle. Your instructor will help you.

Lesson 5: Accuracy Maneuvers

Now that you can fly around and do the basic maneuvers, it's time to start learning how to control your model so that it will do exactly what you want it to do. Again, you will be working with the five basic maneuvers, but now any old turn will have to be a turn of 90 or 180 degrees. And you will have to maintain altitude during the turns. The whole idea of this lesson is to develop your skill and ability as a flier.

Lesson 6: Orientation Maneuvers

During this lesson your instructor will have you fly a Figure 8 pattern and a rectangular pattern. The purpose of these maneuvers is to discipline your reflexes and judgment.

Lesson 7: Stalls

"If you pull back on the stick the airplane goes up. Pull back some more and the airplane goes down!" That's a stall. But there's a little more to it and in this lesson you will learn how to recognize and recover from stalls. More important, you will learn how to avoid unintentional stalls.

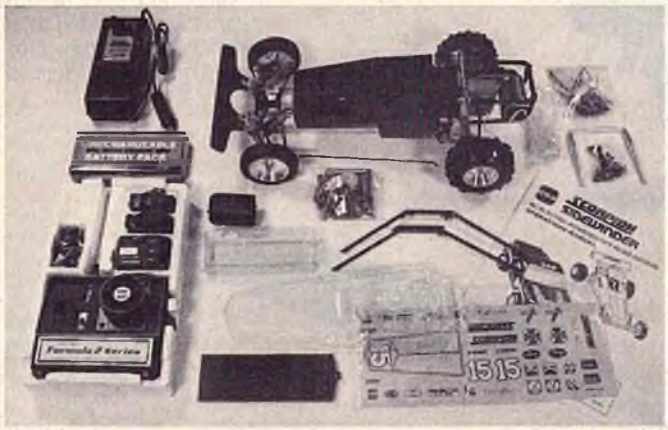
Lesson 8: Take-offs

Most models crash during take-off and landing. That's not said to scare you. It's a fact, because the model is near the ground and if it's not properly controlled, there is very little time to

to page 192

RCM PRODUCT REVIEW

Cox Hobbies Scorpion



SPECIFICATIONS

Name	Scorpion
R/C Type	Off-Road Racer
Manufactured By	Cox Hobbies, Div. Leisure Dynamics 4400 West 78th Street Minneapolis, Minnesota 55435
Available From	Retail Outlets
Length	15½ Inches
Width	4¼ Inches
Height	6 Inches
Wheel Base	10 Inches
Power Plant	Mabuchi RS-450S
Power Source	7.2 volt 1200 mh
Gear Ratio	7:1 (Hi speed) 10.5:1 (Low speed)
Recommended No. of Channels	2
Rec. Control Functions	Steering, Throttle
Basic Materials Used In Construction:	
Chassis Rails	Aluminum 1/4" Sq. Rod
Body	Polycarbonate
Wheels	Alloy, Rubber tires
Instruction Manual	Yes (16 Pages)

RCM PROTOTYPE

Motor Used	As supplied in kit
Radio Used	Cox/Sanwa No. 8125, wheel control

SUMMARY

WE LIKED THE:
Quality of materials, excellent fit of parts, ease of assembly, and realistic performance.

WE DIDN'T LIKE THE:
Minor oil leak from the gear box.

Cox Hobbies, 4400 W. 78th St., Minneapolis, Minnesota 55435, is currently offering a 1/10th scale ARTR (almost ready to run) R/C electric powered off-road racer, the Scorpion, which, it claims is for the "beginner to advanced hobbyists, ages 12 and over." Well, all that sounds good, and the color photos and drawings on the large (5½" high x 10" wide x 18" long) carton looks just great, but, we wondered, is this thing really almost ready to run . . . and when it runs will it really be a racer — or just another pretty face?

Before we dig into the carton, let's take another look outside. We'll have to say right off the bat that Cox has done an outstanding job of informing prospective purchasers not only of most all the important features of Scorpion, but says up front that in order to complete this rig it will be necessary to get a radio system (2 channel), motor battery, and motor battery charger.

Inside, packaging was well-done although it must be admitted that because of the (almost) pre-assembled car, there weren't too many loose parts to be concerned with. There is enough "work" to be done on Scorpion to satisfy just about all the "builders" in the crowd.

The 1/4" square, solid aluminum chassis rails support a truly almost ready to run car. The front and rear axle-suspension systems complete with alloy wheels and rubber tires are in place and lack only tightening, and adjustment. Also mounted is the Mabuchi motor and gear box. In separate plastic bags we found the speed selector control, rubber steering rod boot, receiver battery clip and switch, foam tape, and plastic bottle of oil, a decal sheet, roll cage and roll bar, motor cover, miscellaneous screws, nuts and bolts, and the clear, unpainted polycarbonate body and wing.

Assembly:

The thirteen page manual (plus a three page supplement) was filled with really excellent line drawings that detailed each of the necessary assembly operations. The mounting of the body couldn't have been easier, entailing only the installation of a short body mounting post atop the motor-battery box! First, however, we had to paint the clear polycarbonate body . . . on the inside surface. The technique of applying paint to the inside surface is an almost 100% sure fire method of getting a "factory finish." Matter of fact, the outside surface will have such a fine gloss that if you want any part of it done with a flat finish (such as flat black), that paint will have to be applied to the outside of the body. We sprayed Scorpion a beautiful cream color using Chevron "Perfect" and, just like the man said, got a super looking job. With all decals applied, it began to look just like a full scale racer what with Bell, Good Year, Valvoline, Champion, Koni, and Loctite well-represented.

Radio and Electrical:

Even though we still had suspension tuning ahead of us,

the manual called for radio and electrical installation at this point.

Any two channel radio system will work fine on Scorpion, of course, but just to keep it all in the family, we used the Cox-Sanwa Formula 2 Series, #8125 wheel control, with standard servos. While we were at it, we added the Cox rechargeable nicad battery pack 6N-1200, 7.2 volt, 1200 mah, and the companion piece the Cox Quick Charger with 15 minute timer, made expressly for the aforementioned motor battery. This is the set up that is used in the instruction manual although, as we've mentioned, just about any two channel outfit would do the job.

The throttle control was the first item on the agenda, and this entailed wiring the motor-battery connector, and the speed selector switch, plus the installation of a water proof motor cover. The throttle and steering are controlled by servo operation, of course, and the Cox-Sanwa 80391 (gold label) servos fit their assigned locations perfectly. It was a simple matter of connecting the steering link rod end to the steering servo via the steering control rod for steering (what else?). The throttle connections were, essentially, the same operation with installation of the throttle rod wire between the servo and the speed selector switch. Both servos were held in position by the (furnished) double sided foam tape, as was the receiver. Incidentally, after some pretty rough usuage, we find that all of these units are still firmly in place. The receiver battery has its own tray that supports and protects it very well. The motor-battery loads from the bottom of the chassis, allowing a quick change if you are running with more than one battery.

Chassis Set Up:

Included in the miscellaneous parts are an extra set of low range gears. Scorpion is shipped with the high gears installed, but we decided to put in the low gear set for better off-road operations as opposed to a better top speed that the

high gears offered. Gear changes are a simple operation consisting of the removal of the back gear cover, loosening the set screws on the metal gear and dual gear, and replacing them with the lower range units --- and re-installing the gear box cover. The final step was the removal of the top cover, and filling the gear box with oil to the centerline of the gears.

Driveshaft end play is adjustable on Scorpion and, like everything else we had encountered, was an easy straightforward job consisting of loosening and retightening four bolts.

Next in line was filling the shock absorbers with oil. Following the manuals advice, we disassembled, filled, and reassembled the shocks one at a time to avoid mixing parts. All four shocks were filled, adjusted, and reinstalled on the car in short order. The ride height was then established by loosening the set screw in the upper spring collar on each shock absorber assembly, and moving the collar up or down as required.

to page 191

U.S. Scale Masters Championships

1983 UNITED STATES SCALE MASTERS CHAMPIONSHIPS

Qualifiers from 13 regional contests met in Southern California for the Championship fly-off.

Photos by Dick Tichenor

1983 U.S. Scale Masters Champion, Tom Cook, with his spectacular F-4C Phantom. Powered by Twin Turbax ducted fans and K & B 7.5 engines.

Second place Mike Mann and Focke Wulf 190A-8. Features flaps, retracts, fuel tank drop, at 1/6 scale weighs 14½ lbs. with O.S. .90 engine.

John Lockwood was third (1/4 point behind 2nd) with B-25G-10. Wingspan of 1015", weighs 22 lbs. Scratch-built retracts. Working bombay doors and bomb drop. HB engines.

Fourth place was taken by Garland Hamilton with his 1/8 scale Grumman F6F-3 Hellcat. Immaculately detailed, weighs 11 lbs., and powered by HP .61 engine.

Kent Walters took fifth place with his superb Douglas SBD-3 Dauntless. Kent is famous for his accurate prototypical bomb drop. SBD weighs 15 lbs. with Webra .91.

The old master, Dave Platt, was the recipient of the One Eighth Air Force Pilot's Choice Award for his outstanding Mitsubishi A6M5c Zero. The 16 lb. beauty is powered by a Super Tigre 2000 engine.

RCM was most excited over the completely detailed Beechcraft T-34C-1 in Argentine colors by Ramon Torres. Ramon (on right) was accompanied on his trip from Florida by his parents, wife and baby. The T-34C-1 weighs 15½ lbs. and uses an O.S. .90 engine.

By Frank Tiano

Well, it's all just history now. The 1983 U.S. Scale Masters Championships are over and a not-so-new champ has once again captured the First Place Trophy and all the prestige that goes along with it.

As you might expect, this year's event was even better than previous years primarily due to the fact that the Southern California Scale Squadron learns well from past errors and it's only a matter of time before the contest will go off without a single hitch.

The Scale Squadron had their hands full this year because, at the very last minute, a primary sponsor decided to drop their contribution of funds. We're not talking chicken feed here, I mean some real big bucks! So, with all the tact he could muster, Harris Lee, the Contest Chairman, sent out a plea for help (in the form of greenbacks) and some real nice guys who run some real great companies responded in the nick of time to make the Masters exactly what it's supposed to be. I would be remiss if I didn't take the time to thank these life saving people and I sincerely hope that every modeler, everywhere, will give these manufacurers continued support by using their products whenever they can. These generous companies included Airtronics, Bob Holman Plans, Dave Platt Models, Enya, Futaba, Gold Coast Awards, Great Planes Mfg., Hobby Shack, Hobby Lobby, House of Balsa, Jet Hangar Hobbies, K & B Mfg., Marks Models, Pica, Pilot, Rhom Products, Robart Mfg., Roush Mfg., Ted Priddy, Pacer Tech & Resources, Royal Prod., Frank Tiano Ent., Scale Flite and J & Z Products. Without the afore mentioned, there might possibly have been no Masters or at least one tht would have disappointed everyone involved. Maybe next year we can find a sponsor who has his act together enough to front a contest of this magnitude. I know for a fact that the results could be very rewarding. Anyway, from all of us who attended to all of you who contributed, a hearty Thank You!

Getting to the contest itself, there were over 40 scheduled contestants but some guys couldn't get permission from their wives to come and others needed a note from their teacher so we wound up with approximately 35 guys ready to fly. By the time the second round started, this had dwindled to only 32. We found that the static judging was fair and the flight judges exactly what you might expect at a contest of this calibre. A quick check of

to page 190

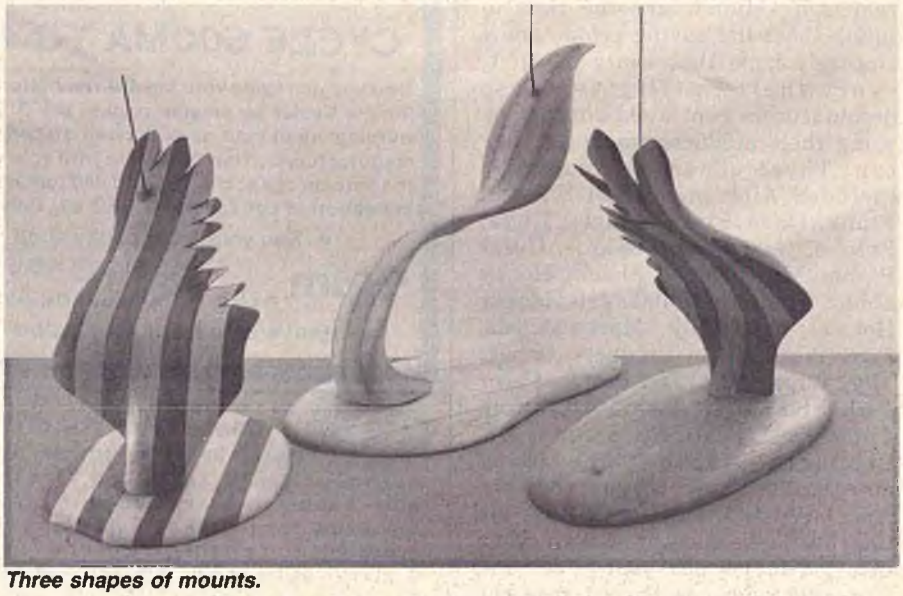
SPECIAL PROJECT

By Stephen E. Kanyusik

The pieces are cut out with a jigsaw or a coping saw, glued with a shop glue. Clamped and left to dry overnight.

A course tooth rasp will be the best way to form and shape the wing.

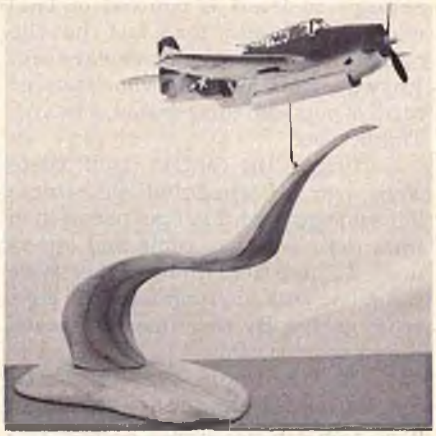
After the wing is shaped, the feathers are cut with a coping saw. The hobby knife helps to trim the feathers.



Three shapes of mounts.

Scale R/C projects can become very involved affairs. Serious modelers often turn to a variety of research sources and many a scale masterpiece is the product of long hours spent pouring over books, magazines, drawings, tech manuals, and photographs. Another easily obtained source of accurate information on literally thousands of aircraft has not been overlooked by scale modelers — the plastic display model. These little beauties are usually very well-detailed, giving the modeler a feel for features lost to the single dimension of a drawing or

The wing and the base are laminated. The music wire is epoxied to the wing.



Free flowing sculpture is the mount for the TBM.

photo. They can also be used to help the modeler arrive at suitable colors and markings before committing his model to the airbrush.

But what do you do with these models after they have served their research purpose? No doubt many end up on shelves collecting dust until broken and finally discarded. These attractive veterans of the long, arduous research process, however, deserve a more glorious retirement.

I have found that mounting the models on carved, laminated wood display stands using a stylized modern art look transforms them into beautiful and unique conversation pieces. They look great in the den and my grandchildren love to receive them as gifts on special occasions. Clubs can also make these as a project and use them for trophies as they are much more original than the usual gold anodized "mantel monsters." They could also be sold at craft shows to help boost the club treasury.

Making the display stands is very simple and you don't have to be a professional woodworker with special tools to do it. Most modelers will have all the tools needed right in their own workshops, and the project should provide a pleasant break from the usual balsa, foam, or fiberglass work.

First, come up with a design you like. The two types I like to make are the "wing" and "flowing" carvings. Once you have arrived at a suitable design, draw a head on view template.

Select a wood that is fairly soft and easy to work. I like to use pine and redwood as they are also inexpensive. Trace the leading edge view template onto 3/4" thick pieces of pine and redwood; make four of each. About seven or eight laminations are required for the "wing" design. This same basic process, of course, applies for the "flowing" or any other design you might dream up.

Glue the laminations together with Elmer's woodworking glue and clamp them securely. Allow it to dry overnight. The next day, place the laminated "blank" into a vice, and using a course tooth rasp start hacking away. Using the rasp is much easier than actually trying to carve the sculpture. When the excess wood is removed, use a finer tooth rasp to smooth the surface. A coping saw and hobby knives are used to shape the wing and feathers. Hand sand the entire stand arm with fine sandpaper for a nice smooth surface.

The base is made the same way as the stand arm and finished in a similar fashion. Make sure you design the base to cover enough area to adequately support the model and sculpture.

to page 190

BREAKERLESS CAPACITIVE DISCHARGE IGNITION SYSTEM

C.H. Electronics is proud to announce the production of our new Breakerless Capacitive Discharge Ignition System (C.D.I.) for model airplane engines.

This ignition system can easily be installed on virtually any engine from a .19 to the larger chain saw type engine. Now you can get rid of the heavy magneto and flywheel on your larger engine.

The ignition system, ready to fly, with batteries, weighs eight ounces, even less with a 250 ma battery pack. A 250 ma pack will run the engine about two hours.

The heart of the C.H. system is a solid state switching device that eliminates the use of breaker points. The high intensity spark generated by the transistor oscillator circuit keeps the spark plug clean and free of carbon.

Using a gasoline and oil mixture, your flight time per ounce of fuel will normally increase two to three times over that of glow fuel. You can use a larger prop and your engine will start easier and idle better.

For complete description, prices, and ordering information, write to: C.H. Electronics, Inc., P.O. Box 1732, Riverton, Wyoming 82501. □

RCM ENYA ENGINE & SUBSCRIPTION CONTEST

NOVEMBER WINNERS

1st Place — Dr. D.C. Jeutter
Grafton, Wisconsin

2nd Place — G.C. Watson
Boulder City, Nevada

3rd Place — P. Smith
Tiptonville, Tennessee

4th Place — G.M. Babcock
Spring Valley, NY

SPECIAL PROJECT

from page 184/182

To fit the base and arm together, mark the spot on the base where the screw holding the arm will set. Drill a corresponding hole through the base and the bottom of the arm. Epoxy and a long wood screw will hold the two units together. A sturdy piece of music wire epoxied to the arm holds the model in an in-flight attitude.

To finish, hand rub a few coats of "Tung Oil" varnish on the piece to give it a nice tone and to seal the wood.

The finished product is a sight to behold and the mount can be used with a variety of models. Try making a few different mounts and interchanging these with different models every so often for a change of decor. □

U.S. SCALE MASTERS

from page 181/180

the scoreboard between rounds indicated that this year it was truly anybody's contest. The lead changed hands no less than three times during a given round!

To give you a better idea of the degree of competition, only 11.275 points separated the 1st place finisher from the person in 10th. And, if that's not impressive, consider that the first five places were separated by a mere 4.125 points. Like I said, it could have been anybody's contest.

But, it wasn't anybody's contest. Tom Cook and his awesome F-4, twin engined, fire breathing, warp 6, incredible Phantom, repeated his win of two years ago with some superb flying and a not so bad 97 static score. Tom had the Phantom cooking on at least four of the six rounds and, since the final scores only pull from the two best rounds, he easily pulled into first after the fifth round. There was a lot of challenging going on but somehow T.C. just kept a little bit ahead of everybody else to walk off with all the marbles.

It was a real shame to see many would-be contenders have so much equipment trouble. It seems that no matter how much you practice and make sure that everything is perfect before you pack the ship up for shipmemt, something always goes wrong by the time you unpack it. Bob Florence couldn't get his CAP 21 airborne, Dave Lovitt had dolly trouble with his ME163, Bill Steffes had severe engine troubles with his new OS 120 4-stroke, I was plagued with some serious overheating problems, Roger Hanson had to make six engine changes in his F-4 before Tom Cook finally straightened it out, Dave Platt had landing gear problems, and so on and so on and so on. If there had been no equipment problems the outcome could have been very different indeed. For instance, Jack Aycock, Charlie Chambers, Joe Dolan, Chuck Fuller, Dave Johnson, Dave Lovitt, Larry Scott, Jim Martin, Rick Meyers, Dave Platt, Shailish Patel, Col. Thacker, Earl Thompson, Ramon Torres, Granger Williams, and Bob Florence **all** had static scores above 90 and didn't finish in the first five! The Scale Masters is not a contest

problem all weekend that wasn't solved in an equitable way. And just to be around the likes of Platt, Cook, Walters, and the rest of the guys is a great experience. It's surprising how much you can learn.

Because of the incidental coverage of a few other National and International events, RCM couldn't let me go into a real play by play report of the action and I'm sorry that we can't print a few more pictures of the airplanes and guys who were in attendance. There were some really unusual subjects at the Masters. □

SCORPION

from page 178/176

Camber is built-in but can be thrown off by improper adjustment of the lower control arm. Tightening this arm parallel to the chassis rails ensures proper camber angle. The caster is adjustable by loosening or tightening the pivot arm. The manual gives clear written and visual instructions for all these simple but important adjustments. Toe-in is a matter of individual tie rod adjustments and was the easiest of all to do.

The manual concludes with good directions for breaking in the Mabuchi RS-450 S electric motor, battery maintenance and charging instructions, and running Scorpion. Which brings us to the next step.

Performance:

As mentioned earlier, we installed the low range gears in anticipation of driving Scorpion more in off-road situations rather than racing on hard surfaces. We are here to tell you that this rascal really gets out and moves — with low gears, yet. Imagine this . . . Scorpion is sitting dead still on a **soft** dirt surface. You suddenly jam the throttle open, and with no hesitation those big knobby rear tires start spinning and throwing dirt out behind as the car literally flies across the terrain. Steering response is very fast but also very easy to get used to. The car slows to a stop from full open as soon as the throttle is closed. Using a combination of steering and throttle allows wonderful control of this car, and we continually improved the longer we played.

Due to the oil in the gear box and, to a lesser extent, in the shocks, we noted some leakage initially. The manual comments on this and recommends storing the car in a box or tray. An aluminum foil cake pan works well also. We observed that leakage disappeared after a few runs and reasoned that this was the result of a lower oil level. So, we now hold off filling the gear box until we are ready to run and storing it with a low oil level. If you follow this practice just be sure you do top off the gear box to the centerline of the gears before the next run. This was the only negative item we ran across and, when weighed against the good stuff, fades to near insignificance.

Conclusion:

Some models look great but for one reason or another don't live up to expectations. On the other hand, we've had outfits that looked like something the cat had dragged in, and yet performed like a champ. Which category does Scorpion fit into? Both of them. This is a really great looking model with performance to match. The whole rig reeks of quality from its solid aluminum chassis rails, to cast aluminum suspension arms, to oil filled shock absorbers.

Can a 12 year old assemble and drive this rascal? Well, we are confident that they can if they stick with the manual all the way through. Scorpion is truly a fun project from start to finish. Fun to put together and a real blast to drive. If you ever get the urge to play in the dirt, take a Scorpion along and really have some fun.

□

for pussy cats, even with the 90 static scores you had better fly an 89 flight or above if you even thought about a chance at the first five places.

Thank goodness that the Scale Squadron had thoughtfully planned a cocktail party and banquet to break up some of the frustrations. It really took the edge off for some of the pilots who were overwhelmed with unsolvable problems. Bob Olson and Harris Lee did a fine job of coordinating our off hours and the air conditioned party rooms were a welcome relief after eight hours in blistering 95 degree heat. And they thoughtfully closed up the bar on both nights at 10 p.m. so that we could all go home and get a good night's rest before doing it all over gain the next day.

If you have ever had thoughts about trying to compete in the Scale Masters program, my advice is to go to it. There are plenty of regional events where you can qualify and the final event is worth the hard work. The guys you'll meet are the greatest in the country, the airplanes you'll see are among the finest in the world and you'll have a good time to boot. As intense as you would expect a contest of this calibre to be, it still is loaded with fun and carries a somewhat relaxing atmosphere. The Squadron really goes out of their way to please the contestant and there was not one

FLIGHT TRAINING COURSE

from page 172/167

correct the situation. So during this lesson, your instructor will explain the forces that affect a model during take-off and will assist you in making your first take-off.

Lesson 9: Approaches to Landing

In this lesson your instructor will discuss how to land your model. You will fly a rectangular pattern again, and this time you will learn how to make a descent for landing. You'll get to practice this maneuver up high and as you become comfortable with it, the altitude will get lower. When both you and your instructor are satisfied with your progress, you will get to make your first landing.

Lesson 10: Solo Flight

This isn't a lesson as much as a test. You will conduct a flight starting when you get your transmitter from impound, and ending, after you fly, with your transmitter back in impound. Your instructor will monitor this lesson and assist you when necessary. All you have to do is demonstrate good judgment, observe the field rules, and conduct your flight in a safe manner.

Lesson 11: Emergency Procedures

This lesson is designed to acquaint you with what to do in an emergency. If your model is capable of the maneuvers, your instructor will show you how to do loops and rolls, cross wind take-offs and landings, dead stick landings, and will discuss any questions you have relating to flying. The purpose of this lesson is to help you prepare for the unexpected. Hopefully, your instructor will be able to show or tell you something that will help you when you need it the most. Experience will teach you the rest.

"Flying is one of the easiest things in the world to do. It is one of the hardest things to do well." Unknown. □

BEGIN-AIR

from page 151/150

..... landing has been beautiful, she floats in, prop just ticking over, flairs and puts all three down at the same time, featherlight. Another feature we like is that she grooves; give her a bit of right aileron, relax to neutral and she turns gracefully to the right and holds the turn until you neutralize with left aileron just like a pattern ship.

Conclusion:

We realize that quite a number of years of building experience does not allow us to put ourselves in the position of a beginner but we did find out that a kit can be built without all those professional tools and power equipment. A beginner with the average number of hand tools such as pliers, screwdrivers, an X-Acto knife and sandpaper can build a model such as this. We would recommend using a plastic film covering such as MonoKote which only needs one accessory, a source of heat. The family travel iron will suffice for this purpose. The Begin-Air Trainer is a plane you will find easy to build, with the complete instructions enclosed, and one you will enjoy flying time after time. □

Mount Rainier R/C Soc.
Northwest
Model Exposition
Feb. 4-5, 1984 — W.W. Fairgrounds, Puyallup, WA
For further info, contact, Bob Pfeiffer, 10611 136th St. E., Puyallup, Wash. 98373.
Ph. (206) 845-7675

GIVE IT A WHIRL

from page 147/140

It A Whirl" column that I am writing for 1983. I hope you all had a Merry Christmas and that Santa brought you the very helicopter you've always wanted and the family gave you enough spare time to get it built. So until next time, "Give It A Whirl," "Break a Blade." □

CARE AND FEEDING OF MODEL ENGINES

from page 137/127

malfunctions due to some unexplainable cause, you should send the engine to the manufacturer to see if it is covered by any warranty. Now be honest; if you ran the engine too hard or let fuel sit in the engine over the winter, you are responsible for the cost of repairs. If the machining process was responsible for engine failure, the manufacturer will be glad to repair or replace your engine. After all, they want your continuing patronage. You are the best advertiser any business has.

F. Model Engine Tips

As you use your model engine and gain modeling friends, you'll learn many tips for easier and more enjoyable operation. Here's a few to get you started:

(1) Do you often have fuel draw problems? Check for kinks or tiny pinholes anywhere in the fuel line from the engine to inside the fuel tank. Make sure that the fuel tank air vent isn't blocked. As a last resort, use a larger diameter fuel tubing. Why? Try drinking water through a thin straw and a thick straw. You'll see it is easier to drink through the thick straw. An engine will draw fuel easier through a large fuel tubing.

(2) Keep extra screws and fittings around for repairing your model or for replacing items that fall off due to vibration. Having extra parts on hand will keep your model going rather than aborting a few hours of leisurely enjoyment.

(3) Electric starters help get your engine running sooner, but you can also damage your engine quicker as well if you abuse it. Don't jam the starter cup against the engine or pull excessively on the starter belt of a marine engine, as it may distort or seize up the crankshaft. If you should flood the engine, or if it is hard to start, beware of using the starter too much. With too much fuel in the engine, a condition called hydraulic lock can occur, when the piston will seize up due to the incompressibility of the fuel. The connecting rod or crankshaft can get bent by overusing the starter. Drain the fuel out of the engine before you start the engine.

(4) Most marine engines can be broken in by using an airplane propeller. If the engine must be broken in while inside the model, be sure to run the model boat in a tub of water to provide a load for the boat propeller and engine. Also make sure that the water jacket on the engine gets sufficient water for cooling.

(5) You don't have to close the needle on an engine after every use or after a day's use. This little idea is often not picked up by beginning modelers. If the engine should accumulate fuel between refilling the fuel tank and starting the engine, don't close the needle to shut off the flow. Use a clothespin or a fuel line clamp to keep the fuel from running into the carburetor.

(6) Avoid buying an engine with a fuel pump or an add-on fuel pump until you are experienced with your engines. They do provide better power and fuel flow, but you should get to know engines better so that you can tell the difference between a problem with a needle setting and a fuel pump setting.

(7) Fuel filters and air filters are good items, especially if the model is used in a dirty environment. A cheap air filter you can use is a piece of nylon stocking (with your girlfriends', wifes', mistresses' permission, of course!) Tie the piece of nylon around the air intake with thread.

(8) Follow the warnings about propellers provided with their packaging. Your hobby dealer can provide you with a set of warnings on the use of nylon and wood propellers, which you should heed.

As you operate your model engine safely and properly, you will enjoy many hours of happy modeling. Get out and enjoy your hobby (your engine will love you for it). □

SCALE VIEWS

from page 100/92

military aircraft. This lettering comes out pretty small at the scales used for most models of military aircraft and cannot usually be seen in photos of the aircraft unless they are close-ups of the prop. A decision on whether to add lettering to your scale prop might depend on what you have in your scale presentation to back up the detail.

If your prop blades are going into a hub that does not have a spinner hiding the variable pitch mechanism, you will have a lot more work cut out for you. These hubs can be built-up from different size tubing or dowels with strips of aluminum tape to simulate flanges. The hub for my P-43 prop was built up from aluminum tubing, aluminum tape and a balsa pitch motor cover turned while chucked in a hand drill. Sig Epoxolite fairs the edges of the tubing to simulate a casting while a hardwood plug centers the blades in the hubs.

When you first see yor scale prop on a new model, you will realize that it was worth every minute spent making it. However, once you have made one, do not expect to use it on all of your models or even to use just the blades on the next one. I have yet to build two models of aircraft where the scale and type of propeller came out the same.

Each new model means carving a new prop. Like most scale builders who have been doing this for awhile, I have a collection of scale props always figuring that some day I can use them on another model. Like I said before, they may last forever. A scale prop is the one item that is never on the model when it goes in on its last flight.

Aluminum Covering:

I doubt if scale builders will ever stop searching for a better way to simulate a natural metal finish on a model. Even if we could build one using the identical types and hardness of aluminum, titanium and stainless steel of the original, it would not look the same when reduced to model size. Surface appearance and finish changes with size so if we can find some other finish that looks like the real thing from a short distance that is good enough. I have yet to find anything that looks more like aluminum on a model than the Dupli-color spray can enamel I use on my P-43. At the same time I cannot think of anything worse to use on a glow fueled model. The paint just does not have a very stable binder. Just recently I had a chance to try a new product that is certainly fuel proof and has some other advantages.

to page 198

from page 196/92

It is easier to talk about a new product after you have tried it so I waited to say anything about Coverite's new Aluminum Micafilm until I had actually used it to cover a model. Micafilm must be the lightest weight heat shrink material on the market. If you need absolute minimum weight for your model you might want to try Micafilm for that reason alone. The aluminum Micafilm has a real aluminum look. It is not as shiny as Reynolds aluminum foil but a lot shinier than the natural aluminum posts holding the screen on my patio. It has a slight surface texture due to the weave of the silkspan-like material under the aluminum surface but this cannot be seen except very close up. The surface sheen of the film can be modified somewhat with steel wool and it accepted both acrylic and epoxy paints without problem.

Micafilm does not have an adhesive on the back so you must use a separate adhesive like Balsarite or Quick Stick on the surface you are going to cover. I used Quick Stick and found that the film ironed onto a solid surface easier than any other heat shrink material that I have tried. I am no expert with the heat shrink stuff so if I can get it on without wrinkles and bubbles, anyone can. I did have some trouble with the edges where the material was overlapped onto itself and I did not leave much material to make the lap. You have to add more glue where you overlap the film and I could not get a lap of less than 1/8" to stick well. I found that CA would stick these edges down okay with a little extra care so as not to make a mess.

In spite of its light weight, Micafilm is plenty tough. The model I covered was a test bed for ducted fan experiments and has survived a flat spin into a lake, landings in the weeds and a bath in 25% nitro. The covering has not sagged, torn or punctured and looks just as it did the first day. The nitro did affect the acrylic paint but not the epoxy. Micafilm may not satisfy every application where you wish to simulate aluminum but it is a welcome addition to the scale modelers options for finishing. Coverite is to be congratulated on their new product.

Big Pilots:

Not all 1/3rd scale models of aircraft are real biggies but 1/3rd scale models of people are all going to look pretty large. I don't know if "Tattoo" is a pilot but if you cut just about any other pilot

to page 203

SCALE VIEWS

from page 198/192

down to 1/3rd, you still have a fair size figure. One of the most realistic large pilots to come on the market is the 1/3rd scale civilian pilot figure by William M. Hawkes of 7148 Lasting Way, Columbia, Maryland 21045. Molded from plastic, the figure is complete down to his sneakers and, when painted with the recommended Poly-S paints, he looks like someone you should know. Ready for the cockpit, the full figure will add about a pound to a 1/3rd scale model.

If the smaller scale pilots, both civilian and military, planned for production by Mr. Hawkes look as real as this one, they will also be a welcome addition to our choices for the next scale project. □

BIG IS BEAUTIFUL

from page 79/78

visited a local scrap metal dealer. They happened to have a 46 pound chunk of lead sheet 1/4" thick that will do the trick quite nicely. I cut a square, 6" a side from the lead and weighed it — 2½ pounds — so four such pieces will make up the ten pounds I need. These will be easily bolted in place on the firewall to provide the required balance weight. The sheet lead is very handy in this use as I bolted one such 6" square on the firewall behind the engine mount and it provided a much needed extra 1/4" of clearance between the prop and the cowl. The remaining pieces will be bolted on around the mount. There's plenty of room in that oversized cowl to do this and, despite the added weight, it isn't going to be the problem I had thought it would.

If you have a scrap metal dealer in your area, drop in and see him for some sheet lead, especially if you're building a Sopwith Pup (or any other WW I machine for that matter).

Another season of flying is not that far off as you read this. When you start going out to the flying field this spring, look around for the stranger, the new guy who usually hangs about the edges of the group, doesn't say much and may have a new model in the back of his car. If he's like most newcomers, he'll leave it there, will be reluctant to ask for help and may get discouraged. Watch for him and try to make him welcome, give him some help and make a flier out of him. We all started out knowing very little about this hobby and, in almost every case, we had help from someone more knowledgeable in the beginning ... pass it on! Someone once said a stranger is only a friend we haven't met yet. Make a point of making some new ones! □

B. Ae. Harrier

from page 42/36

shown, epoxied securely. Due to the model's long nose, keep the radio as far back as possible to aid in balancing. Depending on your radio's size, try to mount both receiver and battery between F-4 and F-5.

Carefully balance the model according to the plan. If necessary, add lead to the rear inside the hollow tailcone.

Flying:

Before attempting an actual take-off with the Harrier, try a fast taxi run at full throttle to check nosegear tracking. It should roll straight ahead; if not, make adjustments and try again.

When you are comfortable with the model's ground handling, try a take-off. Because of its high wing loading, give the Harrier a long take-off run. The model should take off without the use of elevator.

After adjusting the trims, start to carefully explore the flight characteristics. I must admit I was worried a little about the anhedral, but these fears proved unfounded. I didn't notice any difference in high speed stability compared with other models. At minimum speed, however, the model does seem a bit unstable, so my advice is to land at a higher speed than the usual sport model. This is a semi-scale model for the experienced builder and flier. It is not for the beginner.

The Harrier should prove to be a most unusual and exciting model for the sport flier; one that will always be invited to the club demonstration show. □