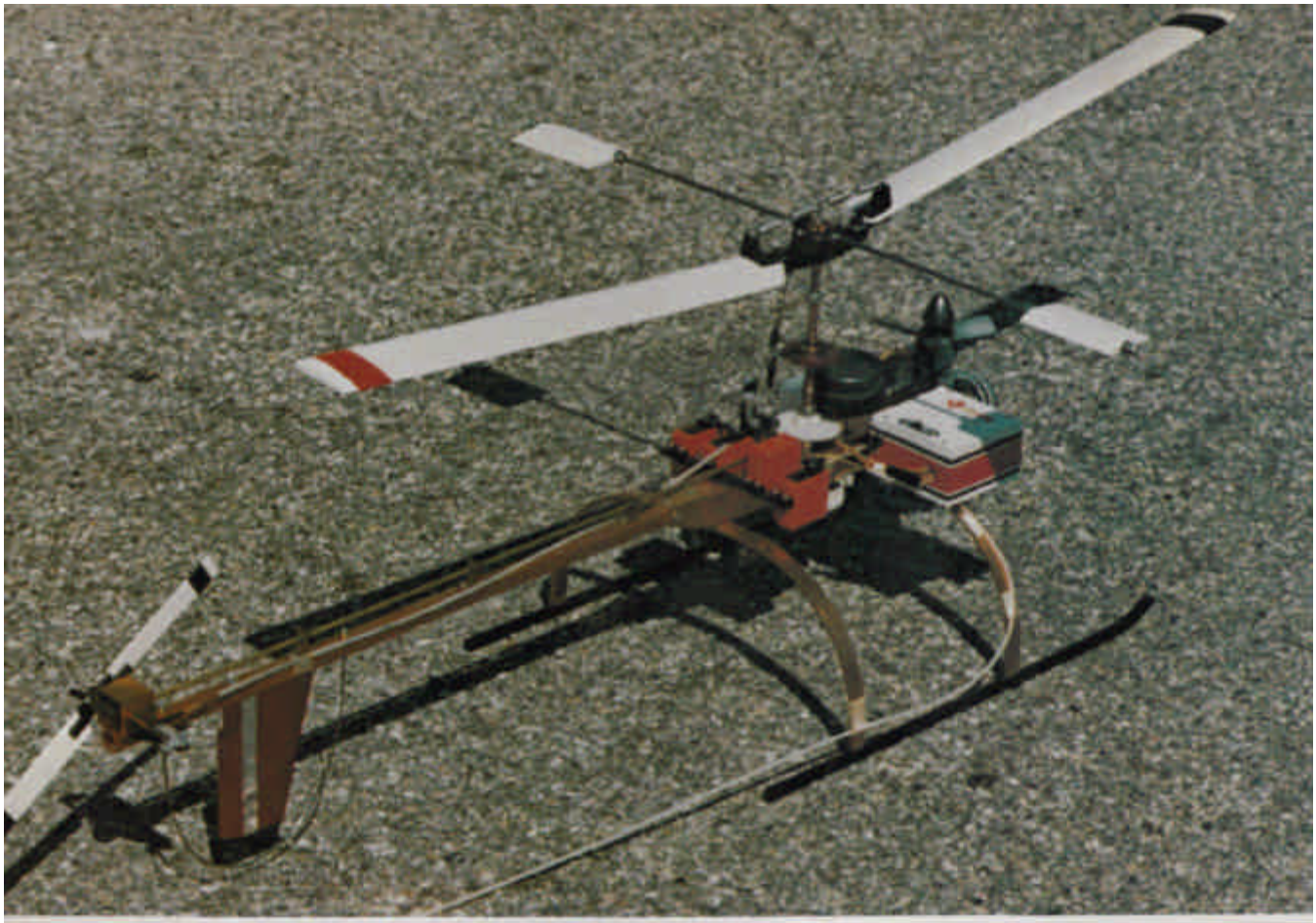
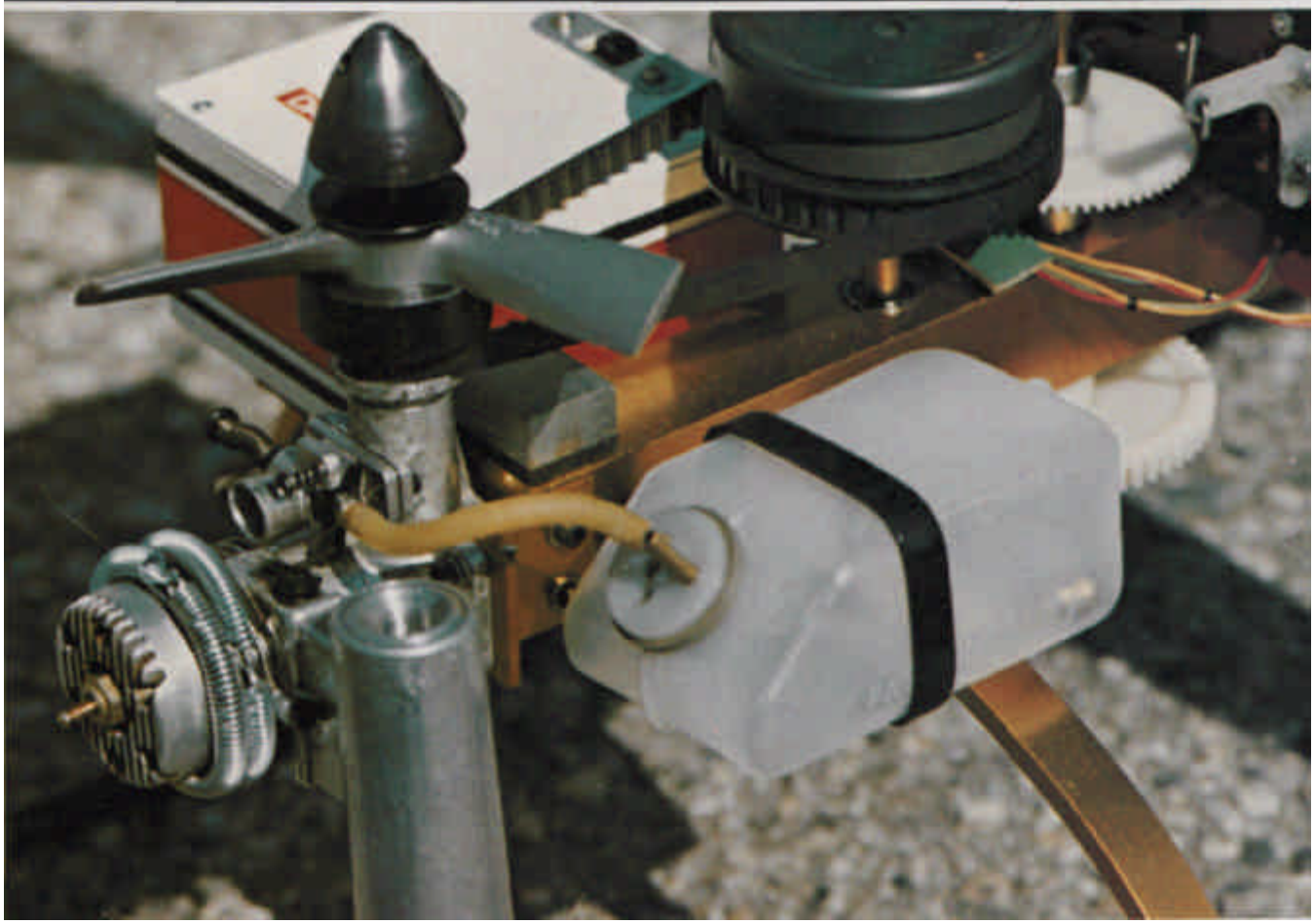




POLECAT

A .19 to .25 powered helicopter that can equal or exceed the performance of the larger machines and can be built at a third of their cost by the average modeler without exotic machine equipment.

BY DAVE KEATS, N66E

PHOTOS BY DON DEWEY, N1A

RlC Modeler Magazine is proud to present Dave Keats' "Polecat," a .19 to .25 powered helicopter that is totally unique in many respects.

First of all, this machine can be built by virtually any RlC modeler with ordinary shop tools and assembled from parts that are readily available in hobby shops, the local hardware store, with a few specialized parts called out in the parts list at the end of this article available from Stock Drive Products in one complete package, while other parts requiring machining can be purchased in a finished state from the author. Unlike scratch-built helicopters that have previously been presented in the model press, this machine can be built by you without the necessity of a lathe and special tooling. And, the total cost of the machine will be approximately one-third of that of those commercially available on the market today.

Performance wise, the Polecat will hold its own with any of the larger machines. Its acceleration is virtually fantastic, and its aerobatic potential is limited only by the ability of the individual flier. This machine has been looped on several occasions, and its flight capabilities were demonstrated at the recent Toledo Conference in winds so strong that pilots of the larger .60 powered machines declined to fly. Yet, this little machine weighs only slightly over 4 lbs. and can be carried in the front seat of a car an added plus if you are used to hauling around one of the 14 Ib. helicopters that require the entire back end of a station wagon!

RCM has a Polecat which was used for the photographs and the pictures accompanying this article. I have derived a great deal of pleasure from this little machine and have found it to be as rugged, if not more so, than any of the larger machines. It is easy to repair, and if you break a main rotor blade it's not going to cost you an arm and a leg to replace it - the rotor blade consist of a 36" length of ¼" square balsa, ½" x ¼" spruce, and 1" trailing edge stock. Glue them together, sand to shape, cut in half, and cover with Solarfilm. Thus, as an example, you can replace the main rotor blades for approximately $1.50. This holds true for virtually every part of this excellent little chopper. Any damage you may do can easily be repaired with readily obtainable material without having to wait for parts to arrive from the factory. We have noticed that the response time is extremely fast on the Polecat, and there is virtually no ' 'lag" time whatsoever. In our opinion, flying the Polecat, as compared to flying some of the larger machines, is somewhat analogous to flying a Quarter Midget compared to a larger, slower high wing sport machine. It is quick and responsive, but with the training prop installed, it is docile enough to serve as a trainer. Its ease of construction, minimum cost, ease of maintenance and transportation, add up to a machine that is almost unbeatable for the helicopter enthusiast. If you've been interested in helicopters, he re's one you can build at a fraction of the cost, and while building it, see exactly what makes a helicopter work, and why.

RlC Modeler Magazine offers its congratulations to Dave Keats on an outstanding job of design and engineering and we hope RCM readers will not only build Dave's Polecat, but drop us a line and send us a photo or two of your particular version. *- Don Dewey*

A Polecat is a cute little animal with a white stripe up its back. Descented, they make quite a docile pet. This Polecat, with one small operation, is also quite docile. Without the small alteration, this 4 ¼ lb. machine is capable of flight in 50 mph winds, stall turns right and left, 540° turns right and left, looping, and, if that's not enough, out accelerating a Kavan "Jet Ranger" to 100 ft!

RC helicopters have really taken off worldwide, many would like to take the plunge but the cost or physical size of present commercial machines have held them back. The Polecat offers a great reduction in size and, if scratch-built, also a savings in cost. The Polecat is extremely rugged and a ready supply of parts is available in the United States. Its small size does not distract from its flight performance, such as large and small aircraft, a very unusual quality indeed. The hover and forward flight characteristics are somewhat different than most commercial machines in that:

1. There is no measurable lag in main rotor response time to control input! This doesn't mean its touchy, just that you don't have to anticipate control anymore!
2. Because of the offset fin, there is no tail rotor yaw in forward flight to correct (hear that, Tucker!). To be fair, the DuBro "Hughes" and "Shark" also track very straight.
3. Forward flight and wide turns can be accomplished with main rotor control only. However, for tight turns and 90° bank turns, some coordinated tail rotor should be added.

If you're all charged up ready to go, just looked at the plan, and then decided to chuck the whole thing, read on. If you study the plans and text carefully and get an understanding of the mechanics involved, you will surprise yourself that everything will fall in place and this is indeed, a very simple machine to build.

CONSTRUCTION

While your hard earned cash is in the mail to various suppliers for materials including the full-size plans, look around town for the aluminum and few miscellaneous parts that can be purchased locally. You can use almost anything in aluminum that you can find, but remember that tail-heavy choppers don't live long and that the material called for on the tail boom is the only critical gauge on the machine. Find the ½" square stock called for.

Fuselage:

Two critical areas: (1) the ½" bearing hole locations and proper perpendicular alignment to main body. (2) the distance from the clutch shaft center to the front of the engine mount. Press in ¼" thick mount reinforcement block before drilling engine mount holes. Drill all the holes before cutting at rear for the taper to the tail boom. Also locate the holes for the rear servo mount rail. Point (A) tank mount, form bracket so the tank stands off at the distance specified on the drawing. All **Stand-Offs on Fuselage** (not tail boom) are attached with 1/8" diameter **medium** length **steel** pop rivets. In fact, if you install the landing gear legs with rivets, it will be more rugged than the 4-40 bolt attachment. However, either will suffice.

Tail Boom:

Do not drill the side or bottom fuselage attachment holes. This will be done when you bend the fuselage sides and bottom in place. All pop rivets in the tail boom must be 1/8" diameter **short steel** except for the bottom fuselage attachment hole. Use medium rivets and just merrily drill away!

Tail Rotor Gear Box:

Here, accuracy is a must. Attach the box to the boom with a **washer** under the head of each 4-40 x ¼" cap head screw. The ball pin and retainer on the blade holders are made from a 2-56 rod end, 2-56 nut, and an eyelet. Be sure and get some vertical movement capability into the balls. I install the rod end and nut (no threads exposed above the nut), slip on the ball and eyelet, cut off the extra rod, shim up the ball 1/32", and solder the eyelet (right). Make sure the 1/8" music wire drive shaft will go through the bearings, before soldering to the front gear. Pre-assemble the gear box cross shaft and lightly tighten the set screw in the gear, to the shaft, remove the cross shaft and at the set screw mark, file in a flat for the set screw. Note: When soldering the gear to the shaft, heat up the parts and use one drop of solder, well flowed in at the tooth end of the gear. Do not get any solder in the teeth or on the hub end.

Main Rotor Shaft:

File a setscrew flat for the 56 tooth main gear only. Also drill a 7/64" hole ½" from the top, for the rotor head attachment. Note that the bottom portion of the shaft must be turned down slightly to fit through the bearings. This can be done with the shaft mounted in a lathe, or electric drill, and using crocus cloth, checking for proper fit.

64 Tooth Nylon Bevel Gear Modifications:

Install the 5/16" I.D. collar on the brass bushing. Push the bushing down flush with the top of the collar. Drill a 1/16" pinhole through the collar and gear and install the 1/16" music wire pin. Lock the gear to the shaft by using the collar set screw only! Do not drill out the bushing for the setscrew, it will hold just fine! (Except in a crash!) **Note:** Turn down some of the gear hub to collar diameter to clear the clutch.

16 Tooth Brass Bevel Gear:

Bush the gear down to the 1/8" music wire shaft and solder the assembly. The tail rotor drive shaft slips through the Rocket City nose wheel block to bush back up to 5/32". The 5/32" collar locks the two parts together. (See note on gear to shaft soldering.)

Swash Plate:

Turn the outer ring from ¼" thick flat stock -----it must be a light press fit over the O.D. of the B539 bearing. One half of the Uni-ball must be turned down to 5/8" diameter. I use a bronze bushing ¾" O.D. x 5/8" I.D. cut to 3/8" long for the upper piece; this assembly must be a light press fit on the I.D. of the B539 bearing. Assemble the swash plate pieces with epoxy. Any tight fits will lock up the ball bearing! On the aluminum outer ring, you need two holes tapped 2-56, 90° from each other, centered in the rings height. On the bronze bushing, there is one 4-40 tapped hole 3/32" from the top.

Rotor Head:

Make sure all parts are square to each other. For the spring teeter, use light springs approximately ¼" O.D. in diameter.

Clutch Shaft:

File flat for the 19-tooth gear set screw.

Clutch:

What a bag of worms! Cut the 5" return spring to 3 7/8". Groove the shoes until the spring goes below the face, then install the shoes and the spring assembly on the base piece. Plyobond the leather pieces on with the rough side out. Do not use clips to hold the plastic retaining rings, and cut the nubs off flush with the face of the plastic pieces. Drill 5/64" holes down through the center of the nubs and use #2 sheet metal screws with washers to attach the plastic retaining rings. Next, because we are using the retaining clamp differently, continue deepening the slit in the bell shaft another 1/4" down into the bell, using a hacksaw blade. Trim off the flashing and lightly grease the bell shaft and drum. **Maintenance Note:** From time to time, the clutch bell must be regreased. (Any time the clutch won't let the engine idle.)

Engine Pulley:

We want to turn down one end of the pulley so that, when assembled; there will be 5/16" of the pulley exposed under the flywheel. To ease assembly, turn down the remaining pulley flange slightly smaller than the engine drive washer. You will also have to bore out the pulley to fit your engine's crankshaft size.

Cooling Fan and "Training Fan"

In the normal fan, bend in the pitch after assembly. This is not critical, and the "eyeball" method is good enough. You might throw a large (5/16" diameter) spring around the cylinder for better cooling, especially with a full muffler. **You should use the muffler modification shown when using the Fox .25 engine.**

The training fan is made up from a 7 x 8 3-bladed nylon prop, a prop extension, and a short piece of ¼-28-thread stud. Cut the prop to make each blade 2" long from center. Also, bore it out to fit the prop extension nut. Cut the prop extension down so you will be able to tighten the prop, and install the spinner nut with the ¼-28 stud. This gives ample cooling while loading the engine down. Forward flight is possible with this combination with no bad characteristics. If your engine will not allow liftoff, you might have to start trimming this prop **1/16"** at a time, down to a minimum of 1 ¾". Be sure to balance 3-bladed training prop as carefully as possible.

Fox .19-.25 Engines:

Start the break-in on a test stand and look for two things: excessive oil out the front bearing (not usually but once in a while) and **IMPORTANT:** if in mid-range it runs very rich, ship it back to Duke and get one with a more linear throttle. Better yet, order it direct and specify linear throttle response for helicopter use. When you have the above satisfactory and get a reasonable idle, take the engine apart (or have it taken apart for you) and cut oil slots in the ends of the rod with a razor saw approximately 1/3 of the way into the holes on both ends, then clean out the burrs and re-assemble. (This is not, I repeat, not necessary for aircraft use, only choppers.) Reinstall on your test stand, installing the chopper drive paraphernalia, including the fan of your choice, and, once again, check the idle (also with modified muffler installed). Do not do a destruct test on the engine, only check the idle and get it as low as possible! Next it will be necessary to rotate the throttle arm 90° toward the engine and re-shape the arm. To loosen the throttle arm nut, hold the barrel with needle nose pliers (carefully) and loosen the retaining nut, rotate arm 90° and re-tighten. If you loosen the nut on the fuel nipple side, good luck in resetting the idle! If you have an excessively rich mid-range with the aluminum cooling fan, you will not be able to control the tail rotor in a hover!

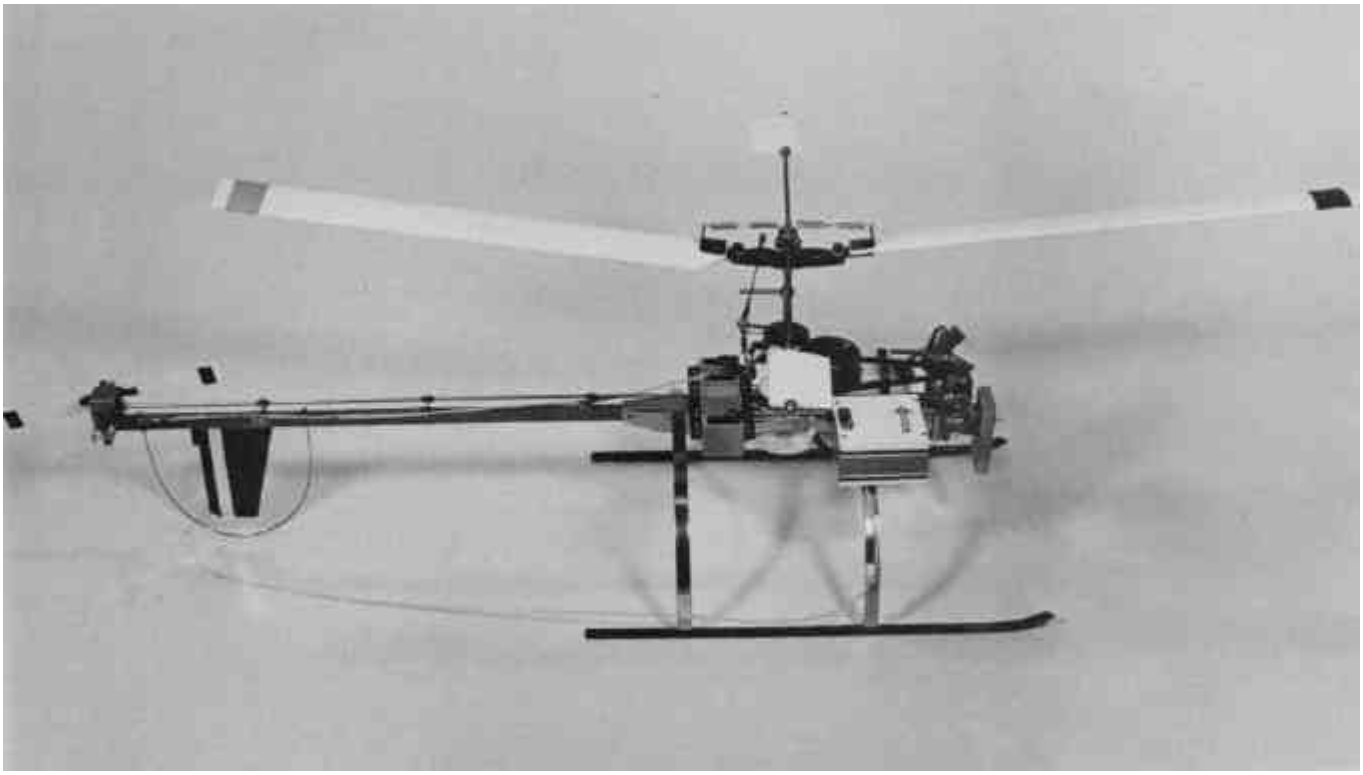
EDITORS NOTE: On the RCM prototype we used a Veco-Lee .19 engine with K & B muffler and heat sink as shown in the photographs. The heat sink is a standard item made for RC car usage and is not, in effect, necessary, but rather, used for nose weight. We found the Veco-Lee .19 to be an extremely powerful engine for the Polecat with a beautiful throttle range from low to full rpm. The Polecat would lift off at slightly more than half throttle even with the training prop installed. We recommend the use of this particular engine, which can be obtained form Clarence Lee, 7215 Foothill Blvd., Tujunga, California 91042, or your local dealer who can order it for you.

If the previous is as clear as mud, wait - - the following gets muddier!

Final Rigging and Set-Up:

The drive belt must **not** be tight! ¼" to 3/8" slop on one side will do - - shim engine to suit. Install the 5/32" x 22" music wire paddle bar; slip the paddle bar control arm collar assembly on one side and a 5/32" collar on the other side of the head. Install the paddles and make sure the paddle bottoms are parallel to each other, and tighten the 3/16" retaining collars. Slide the assembly back and forth until it balances, then tighten the 5/32" collars. (If you have bound up the paddle teeter bearings so balance isn't possible, shame on you — it must be free.) Install the rotor blades next, setting one perpendicular to the paddle bar using the rotor head side plate and a straight edge to align. Tighten the blade holder to the head, and move the other blade fore or

text to page 68



POLECAT PARTS LIST

Stock Drive Products
55 South Denton
New Hyde Park, New York 11040
Quantity:
6 1/8x1/4 flange bearings
2 3/16 x 5/16 flange bearings
4 1/4x1/2 flange bearings
1 ¼" 1/5 pitch 10-tooth pulley
1 ¼" 1/5 pitch 13" timing belt
1 ¼" face 24-pitch 10 tooth plastic spur gear
1 ¼" face 24 pitch 56 tooth plastic spur gear
2 12" of ¼" steel shafting
3 ¼" I.D. collars
4 1 5/16 collar
1 32 pitch 16 tooth brass bevel gear
2 48 pitch 18 tooth steel miter gears
1 5/8 x ¾ x 1 brass bushing

Package #HK-106
Package Price $31.10

Du-Bro Products
Quantity:
3 1/16" wheel collars
5 5/32" wheel collars
1 32 pitch 64 tooth plastic bevel gear
1 solder link without pin
1 swivel

Curtis Dyna Corporation
P.O. Box 297
Westfield, Indiana 46074
Quantity:
1 Curtis car clutch
$8.95 p.p.

Rocket City Products
Quantity:
6 Missing Links
1. Nose wheel bearing block

Prather
Quantity:
1 Prather 11/2 oz. nose weight

Goldberg
Quantity:
3 90 degree bellcranks

K & S TUBING
Quantity:
3 ft. 5/32" brass tubing
12" 3/32" brass tubing
12" 1/8" brass tubing
12" 3/16" brass tubing
12" 9/32" brass tubing
12" 3/16" aluminum tubing

SUPERLINE
Quantity:
10 short rod ends

C.F. Lee Manufacturing Co.
7275 Foothill Blvd.
Tujunga, California 91042
Quantity:
Veco-Lee .19 Custom
Price: $47.50

FOX MANUFACTURING COMPANY
Quantity:
1 .19 or .25 RC engine
1 Flo-thru muffler
1 (set) 3/16" collars #90361
1 Fox spinner nut ¼-28 th.

SULLIVAN
Quantity:
22" 5/32" M.W.
2 ½" 1/8 M.W.
18" 1/16" M.W.

MISCELLANEOUS
Quantity:
10" 1/8 diameter solder 50-50 no core
1 spade bolt and nut
Assortment: 1/8 diameter steel short and medium length pop rivets.
1 Heim Uniball #LS-4
1 B-539 Ball Bearing

PARTS AVAILABLE FROM D. KEATS:
2014 Atlas Drive
Troy, Michigan 48084
Quantity:
1 Curtis clutch modified
Price: $15.00 p.p.
1 Swash plate ready to use
Price: $17.50 p.p.
1 Rotor head assembly ready to use
Price: $20.00 p.p.

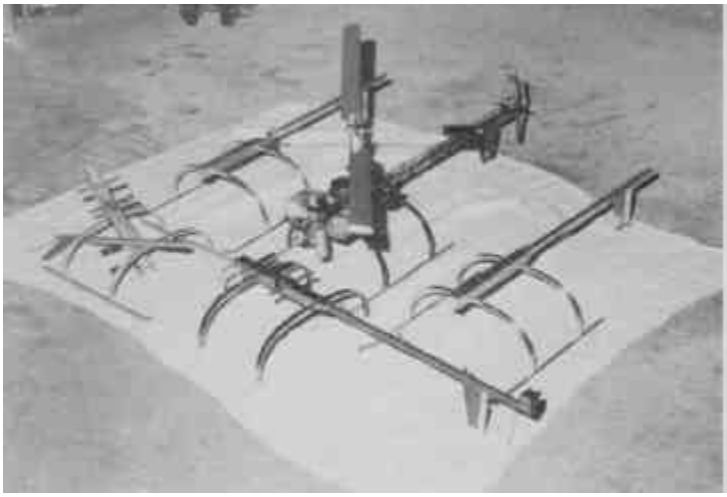
Quantity:
16 4-40 x ¼ Socket head bolts
2 5-40 x ¼ Socket head bolts
10 4-40 x 3/8 Socket head bolts
15 4-40 x ½ Socket head bolts
2 ¼-28 x ¼ Socket head bolts
1 4-40 set screw
3 ¼" flat washers
11 #4 flat washers
1 4-40 elastic nut
1 (set) teeter springs

Package Price: $6.00 p.p.

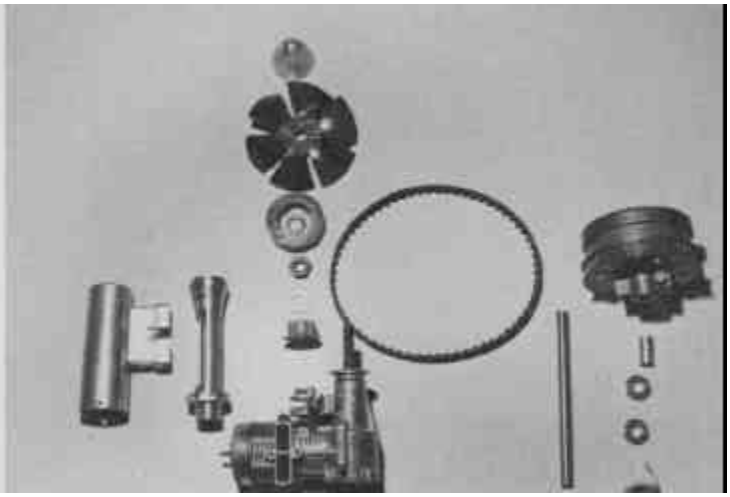
ALUMINUM
Quantity:
12" 1" square 1/16" wall tubing
24" ½" square w/round corners .025 wall
38" 3/16" x ½" bar stock
36" 3/8" O.D. tubing
20" 1/8" x ½" bar stock
1 (piece) 3" square 1/16" thick plate
9" 1/16" x 1" flat stock
20" 1/16" x 3/8" flat stock
3" ½" x 1 " x 3/32" L bar
6" 1" x 1 7/8" x 1/16" L bar
1 (piece) 4" square .010 flat stock
1 (piece) 1" x 8" x 3/32" flat stock
6" ¼" x 1" flat stock
1 (piece) 1 ¾" square x ¼" plate
4" ½" square bar
2" 3/8" square bar

WOOD
Quantity:
6" 1/32" x 2" plywood
8" 1/8" x ¼" spruce
36" ¼" x ½" spruce
36" ¼" square balsa
36" ¼" x 1" T.E. stock (balsa)
6" 3/16" x 2" balsa

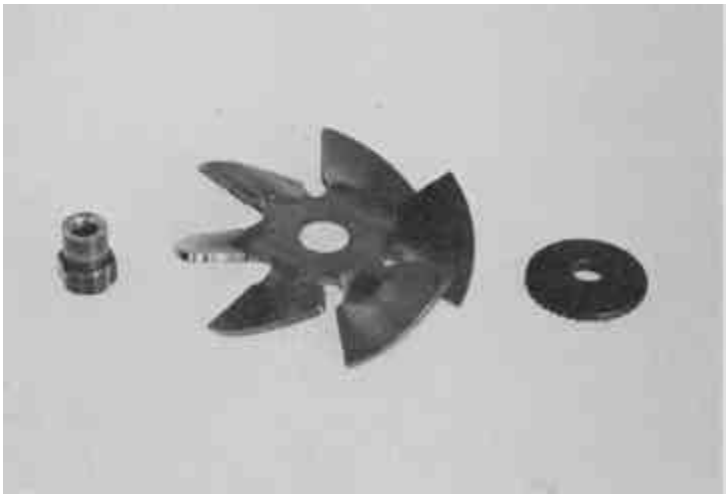
Plans available from RCM Plans Service. (#566)



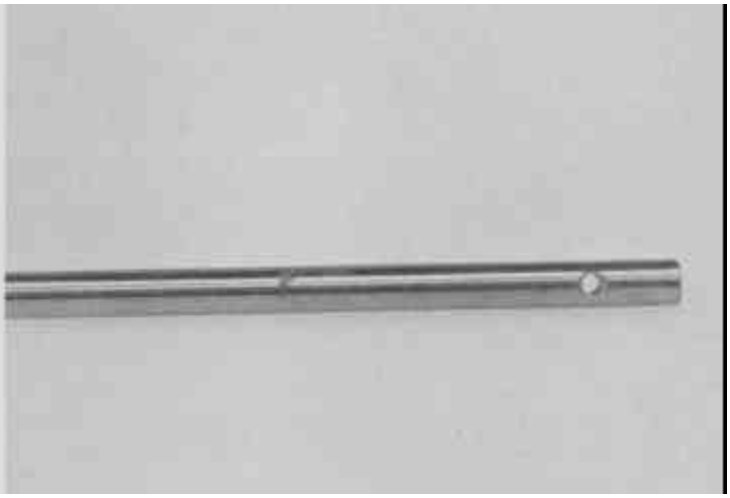
Polecat frameworks in various stages of assembly. Wreck on far left result of a 'Figure 9'. Bob Depew photo.



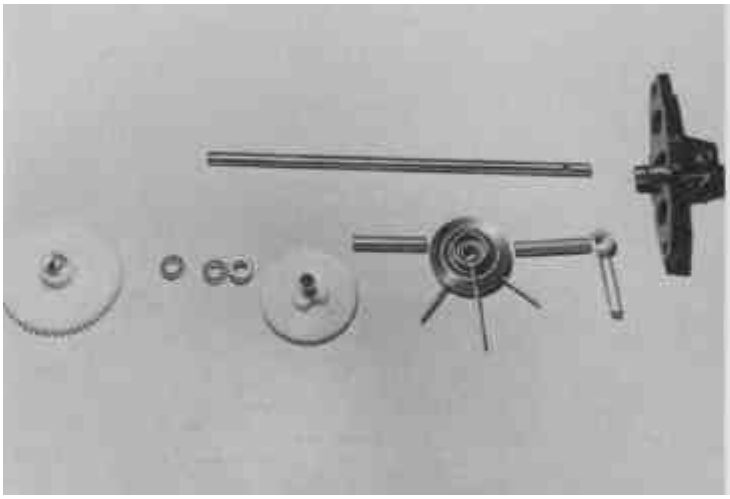
Fox .25 *engine drive components. Note muffler cut-out described in text. Bob Depew Photo.*



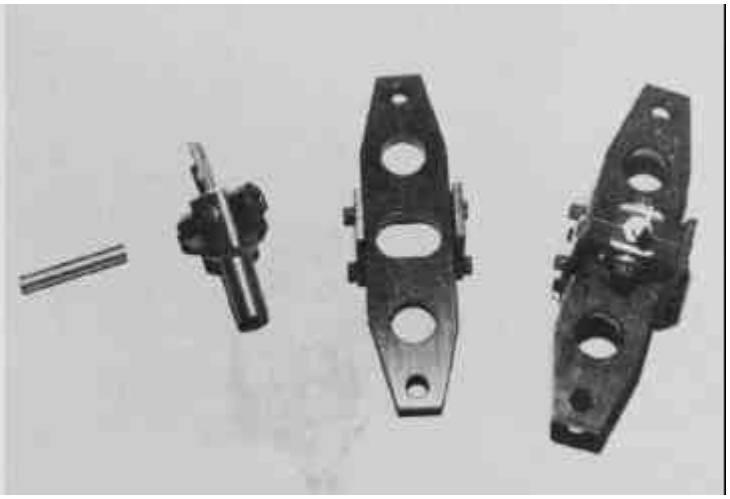
Extension nut, impeller, and drive washer. If you're a novice, start with training prop.



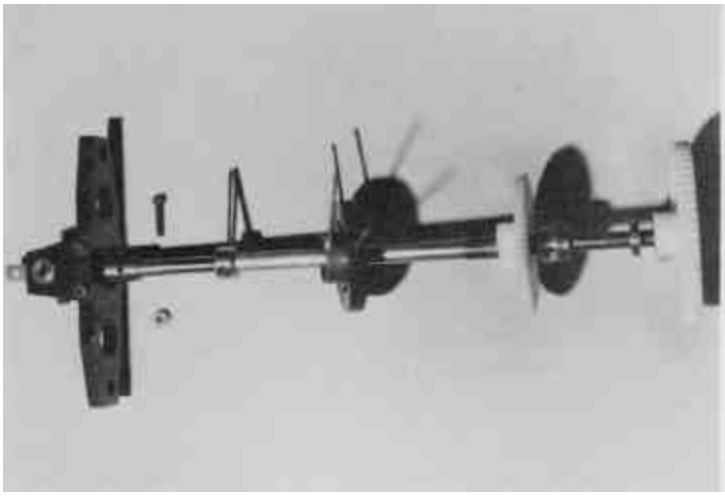
Close-up of top of 1/4" drill rod stock main rotor shaft. Drill #33 hole for rotor head bolt.



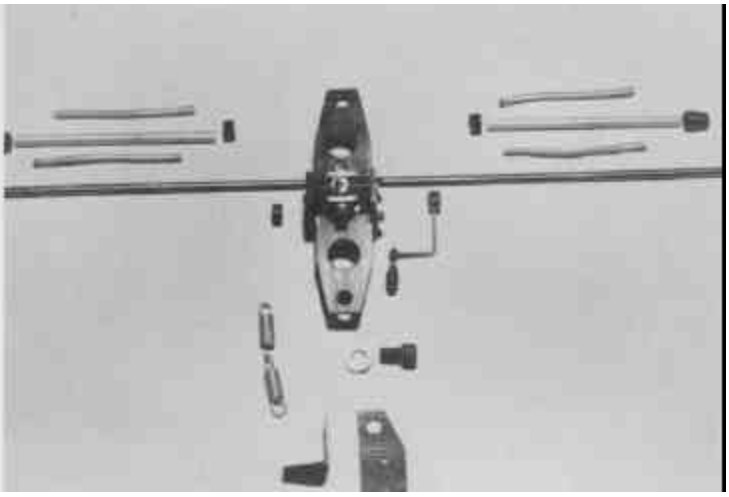
A photo of rotor shaft component arrangement shown disassembled. Bob Depew photo.



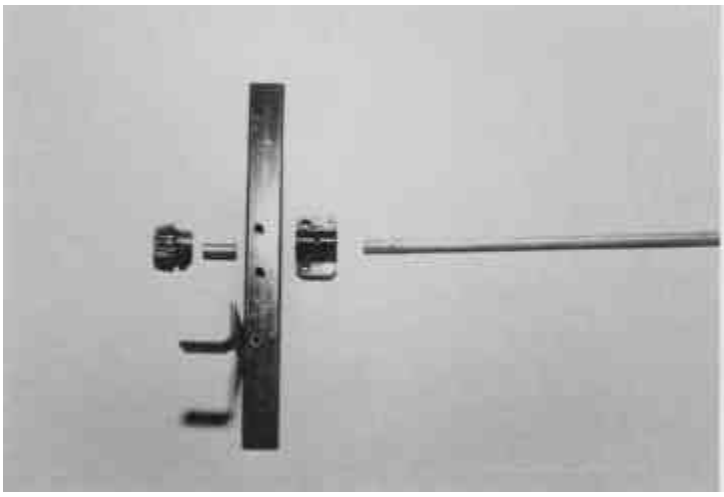
The rotor head shown assembled and disassembled. Bob Depew photo.



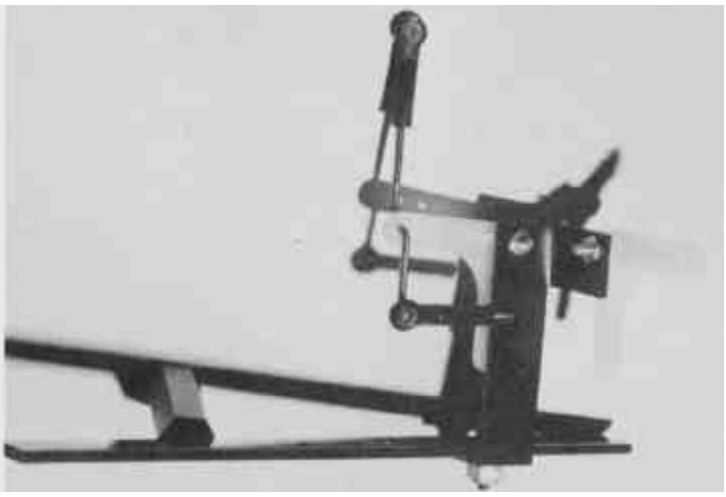
A photo of the main rotor shaft and head, shown assembled. Bob Depew photo.



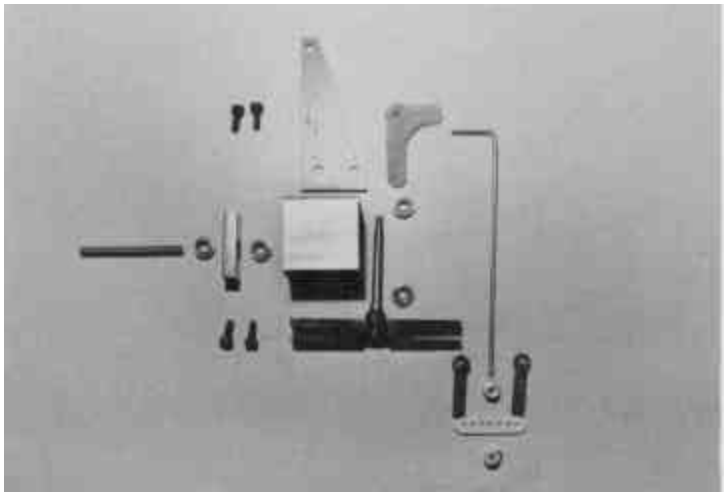
Rotor head layout. Note lengths of solder used as paddle weights. Bob Depew photo.



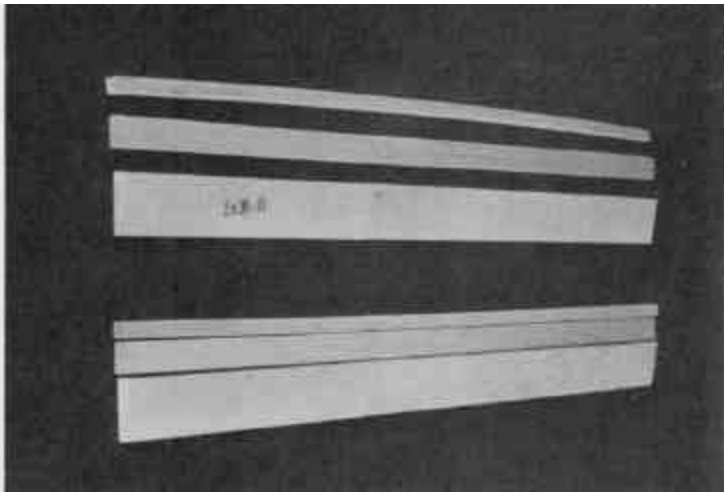
Front servo mount with bellcrank mount. Note gear and tail rotor shaft layout. Bob Depew photo.



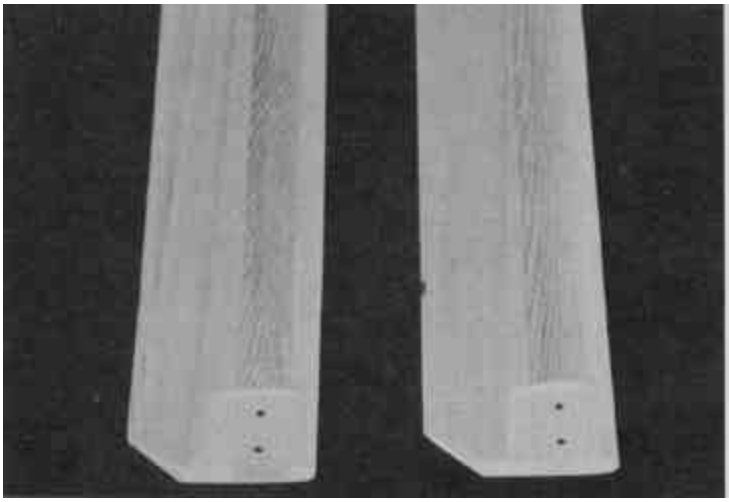
Bellcrank arrangement with anti-rotation link. Bob Depew photo.



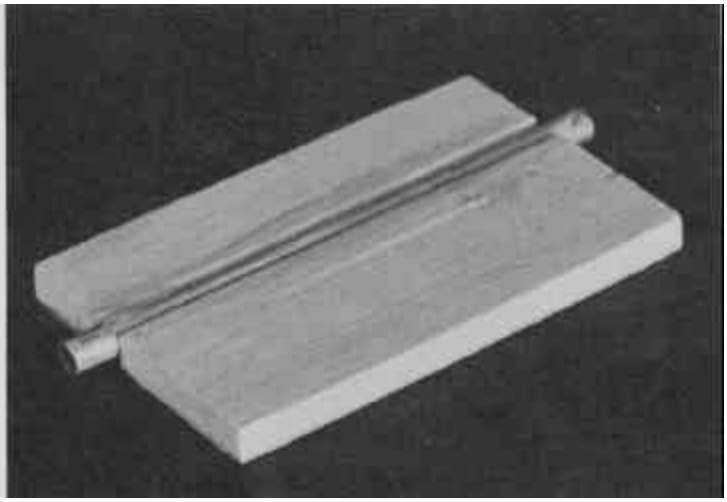
Tail rotor assembly. Gears are not shown in this photo. Bob Depew photo.



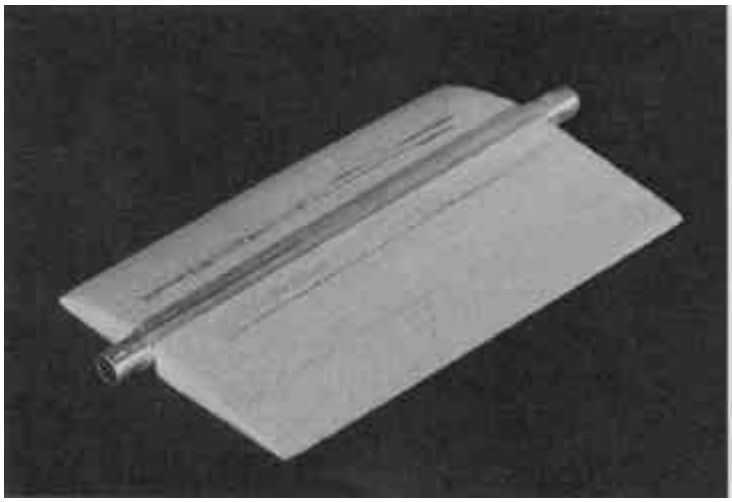
A 36" length each of 1/4" square balsa, 1/4" x 1/2" spruce and 1" trailing edge stock make up main rotor blades.



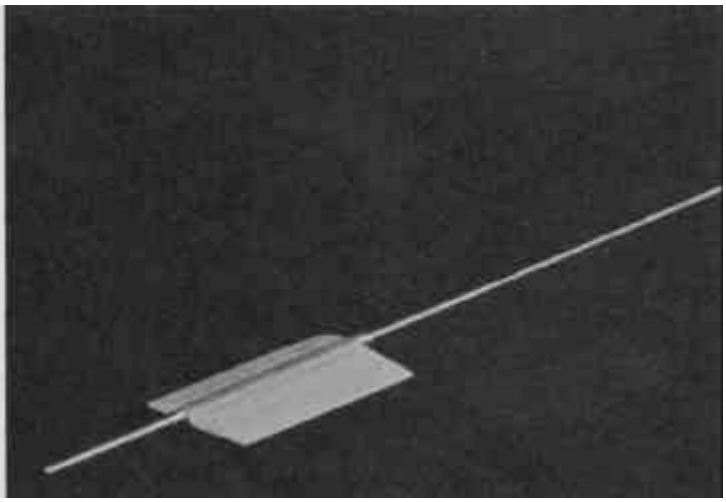
After stock is joined and sanded, 3' length is cut in half and blade holder bolt holes drilled in butt ends.



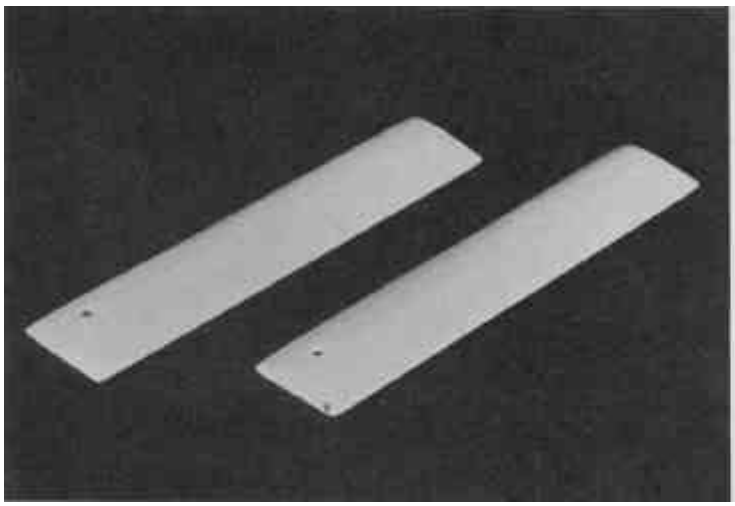
Directional paddle before sanding. 3/16" balsa, 1/32" ply, 3/16" aluminum tubing and two lengths of solder joined with epoxy.



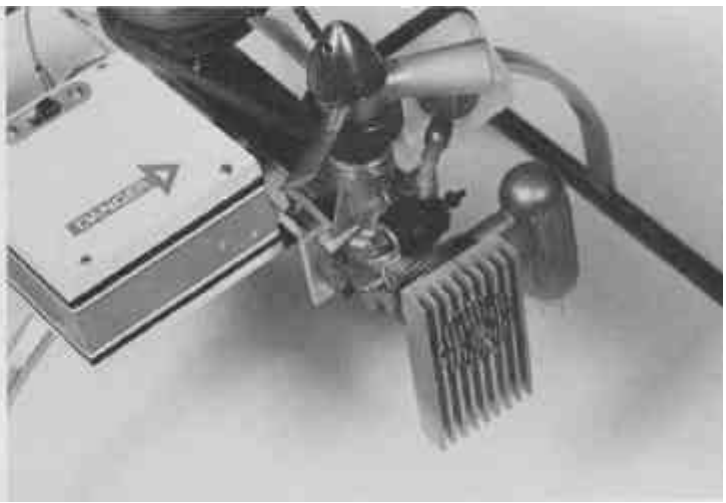
Directional paddle sanded to airfoil, ready for Solarfilm covering.



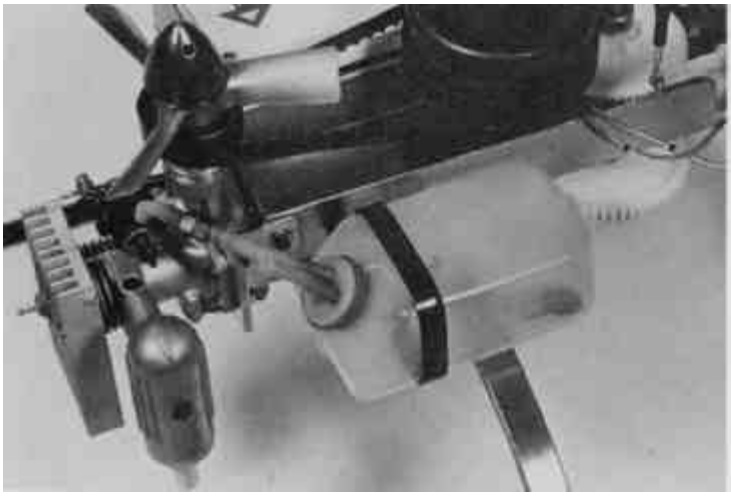
5/32" paddle bar slips through aluminum tubing in each paddle. Secured with wheel collars.



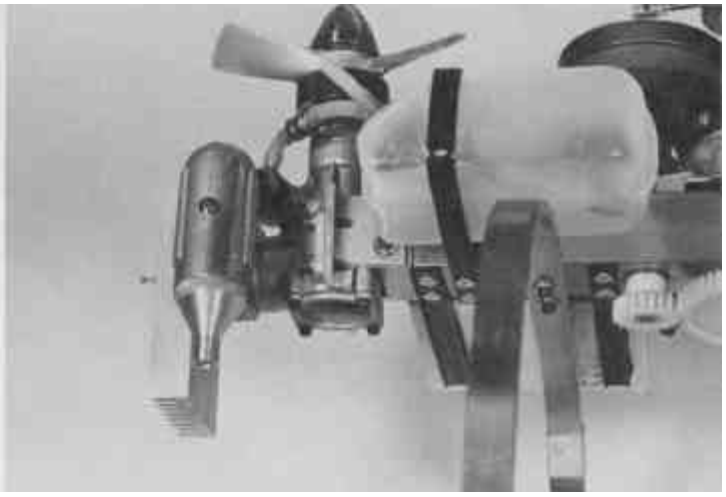
1l8"x3/4" spruce tail rotor blades sanded to airfoil shape.



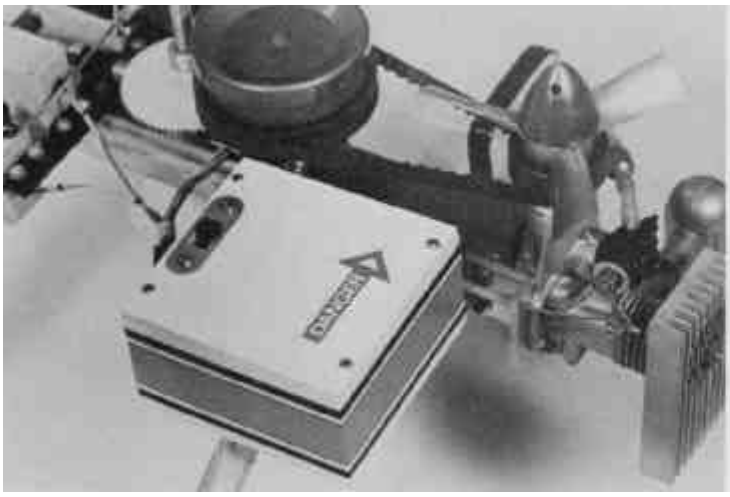
Front view of Veco-Lee .19 installation with K&B Veco .19 muffler, training prop, and heat sink.



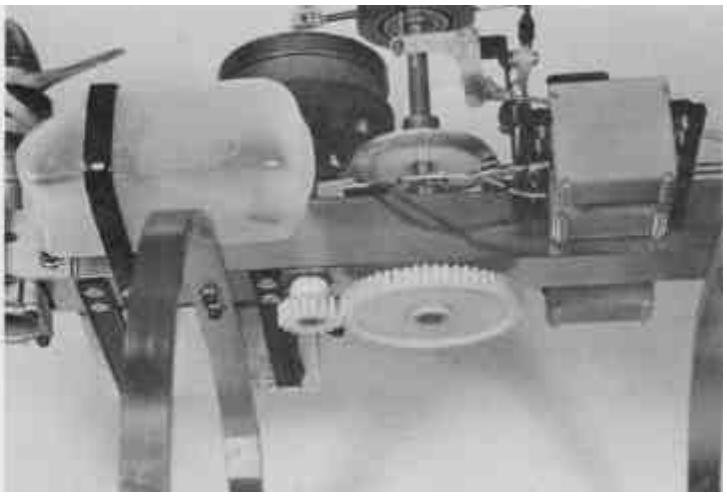
4 oz. *Sullivan SST tank held by metal strap. Larger tank can be installed for NRCHA endurance tasks.*



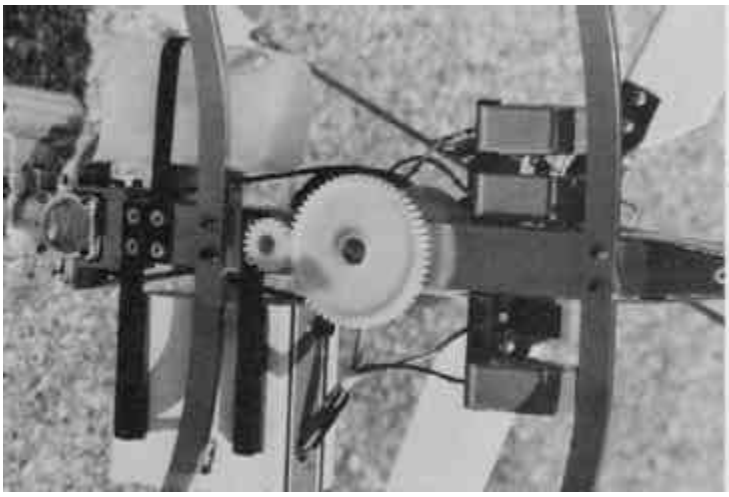
Under view of tank strap mounted to body with pop rivets,



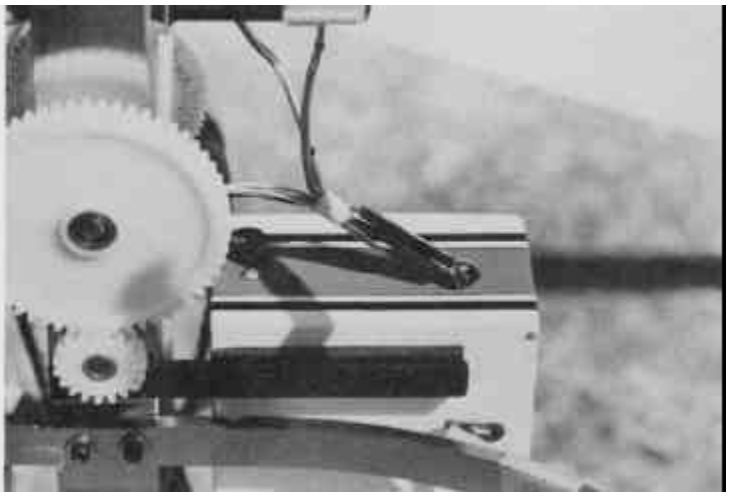
Radio box made of 1116" plywood and covered with Solarfilm. A plastic food container could be used.



Under view of 19 tooth and 56 *tooth gears.*

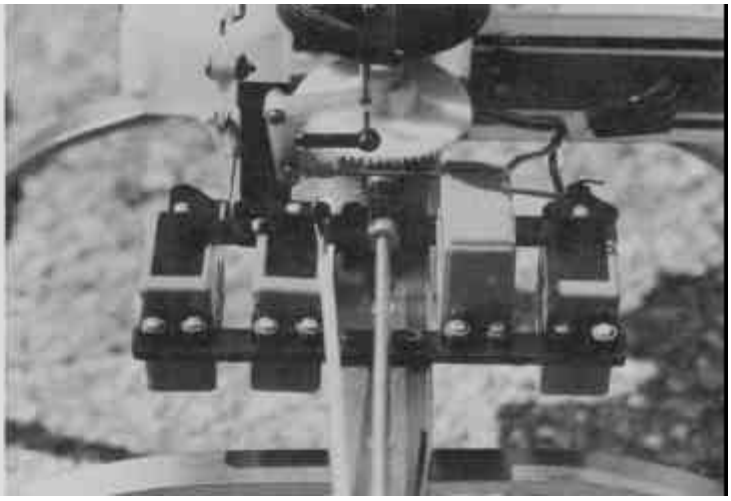


Bottom view to show general layout of components. Pop rivets can be used instead of 4-40's *for skid leg attachment.*

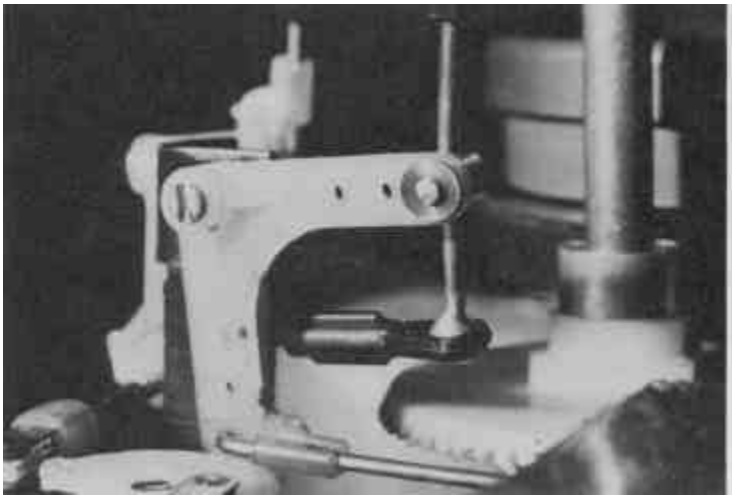


View of receiver box stand-offs. Servo tape holds box to stand-offs.

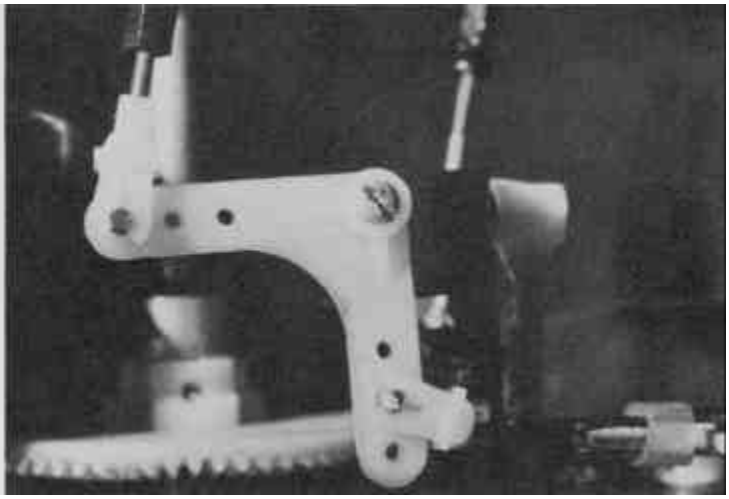
One *of author's prototypes showing World Engine's S-4 servos mounted on 1/8" x 1/2" aluminum servo rails. Bob Depew photo.*



ROM's prototype uses small RS servos. Rails adjustable to any servo spacing.

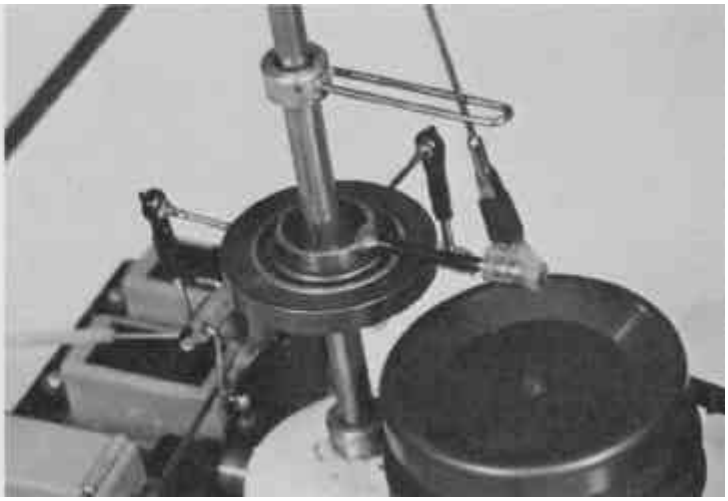


Early prototypes used a Du-Bro coupler on the anti-rotation link. Bob Depew photo.

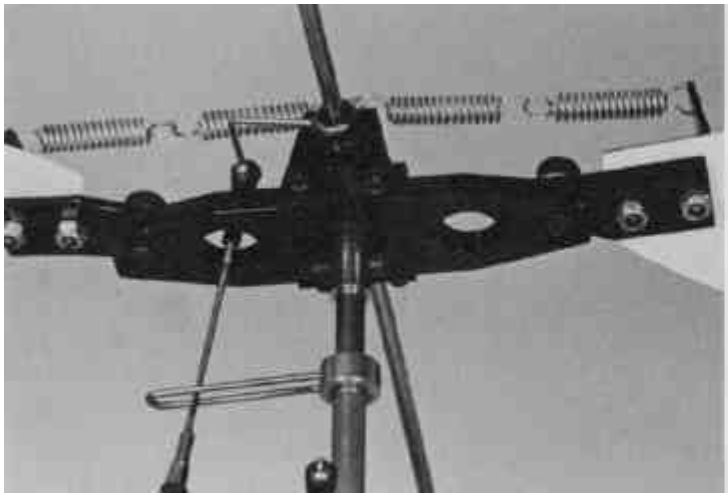


Left and right cyclic control bellcrank with pushrod keepers, Bob Depew photo.

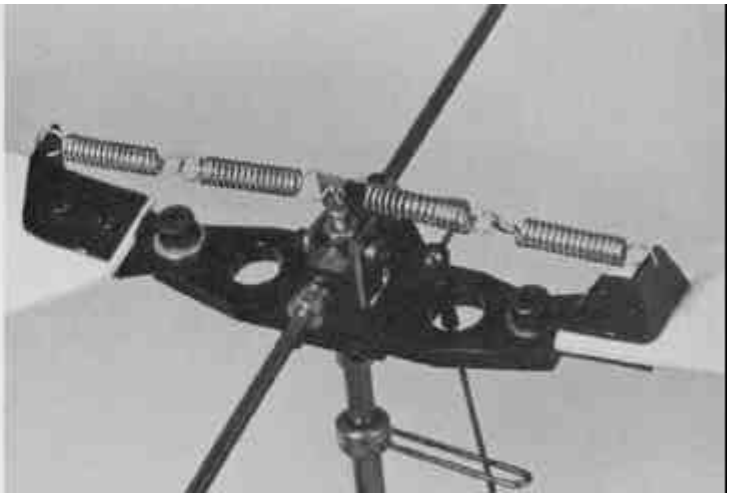
View of swashplate.



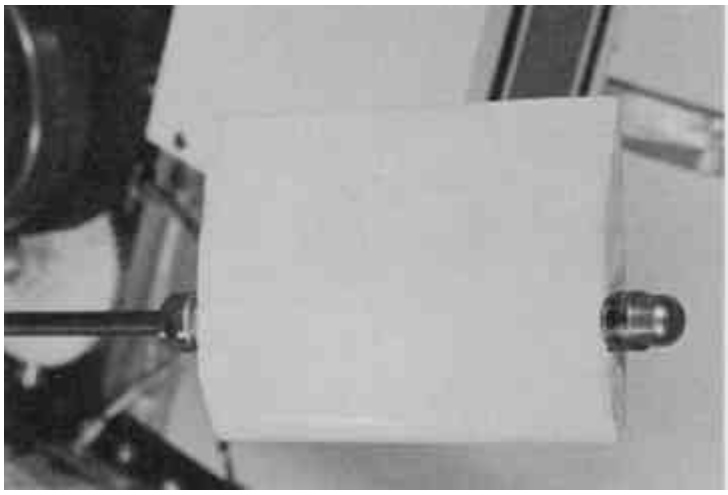
Swashplate control rod to steering paddle and anti-rotation yoke.



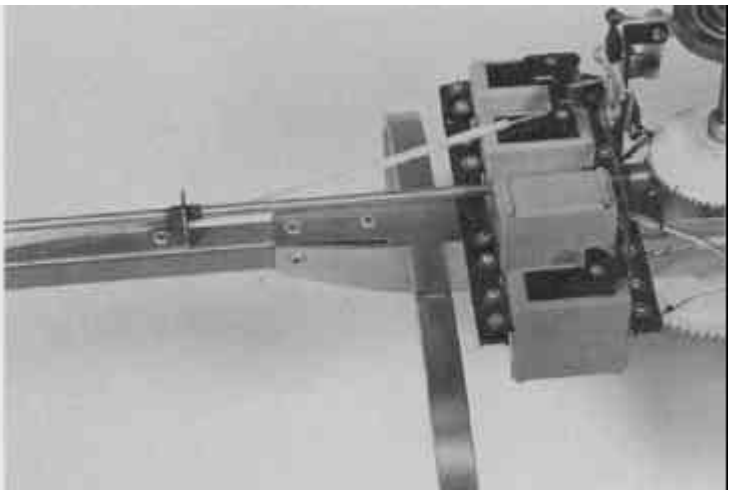
View of underside of rotor head.



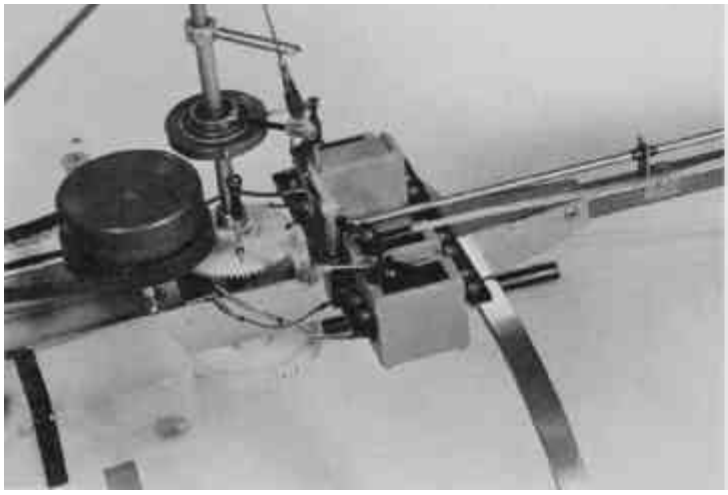
Close-up of top of rotor head, completely assembled.



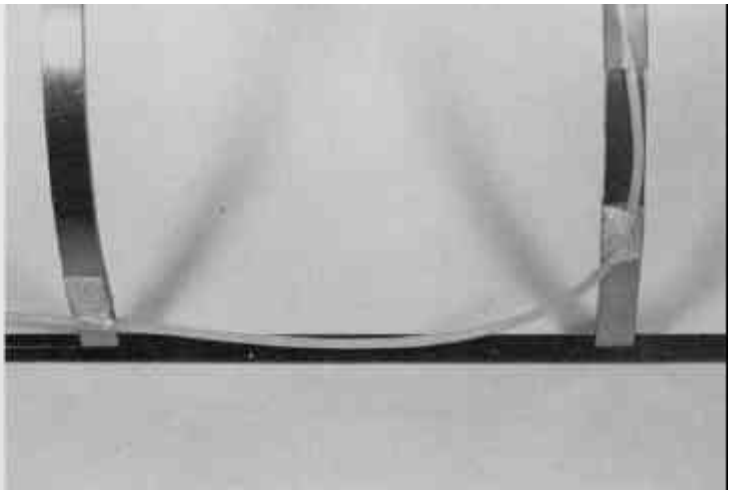
View of Solarfilmed paddle bar. Fox wheel collar on end. Du-Bro wheel collar can be used if Fox not available.



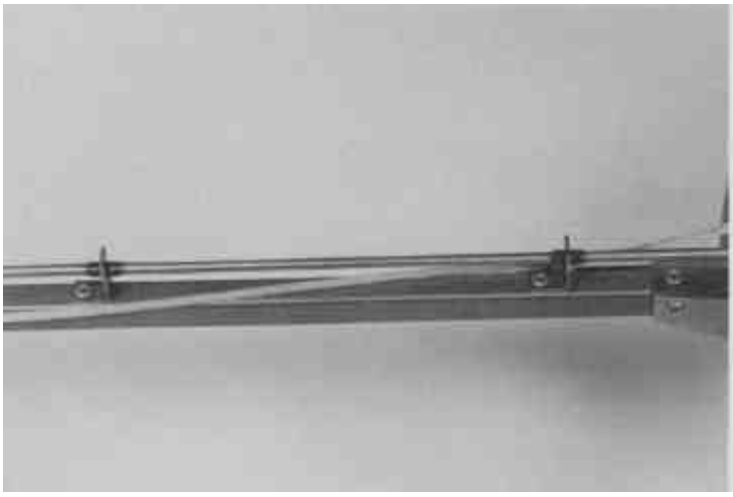
Overall view of servo mounting and brass tubing tail rotor drive shaft.



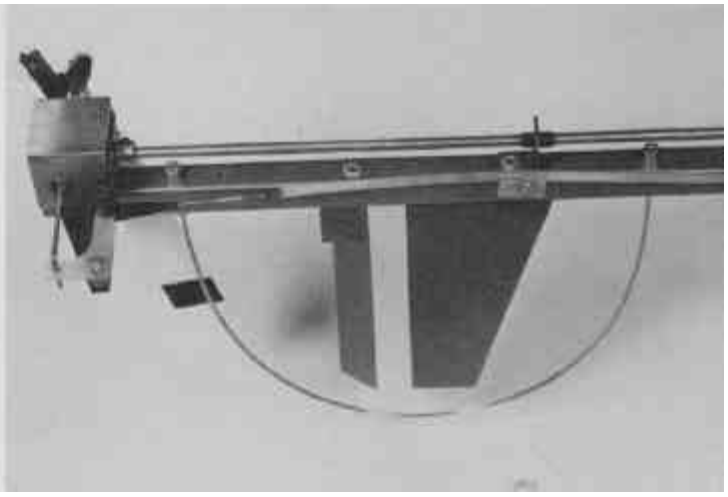
Opposite view of servo mounting and tail rotor drive shaft.



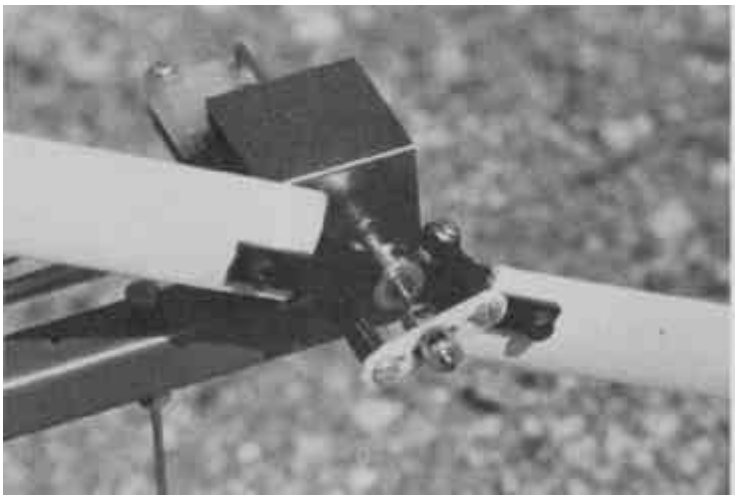
Antenna routed from radio box through a nylon tube and secured to skid legs.



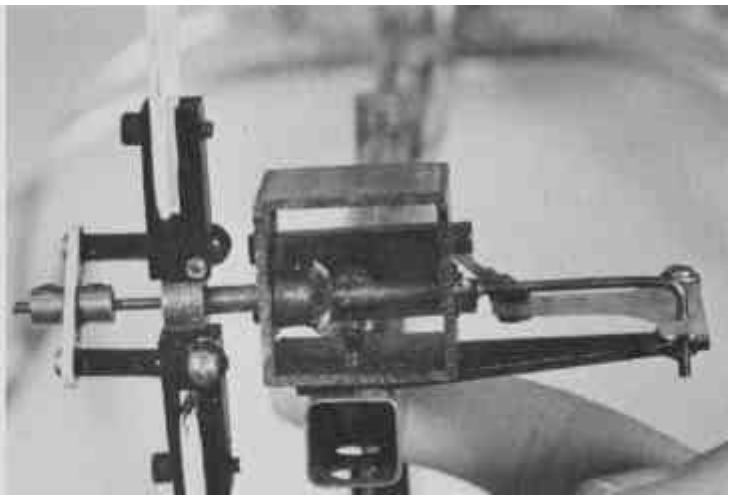
View of tail boom showing stand-off tail rotor drive shaft supports. Nylon tube houses control rod for tail rotor.



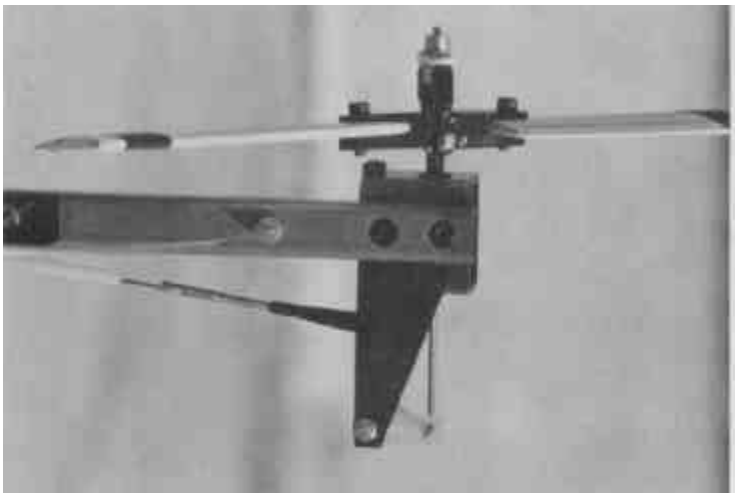
View of .010 fin and tail rotor gear box mounting. Skid can be a semi-circle, as shown, if desired.



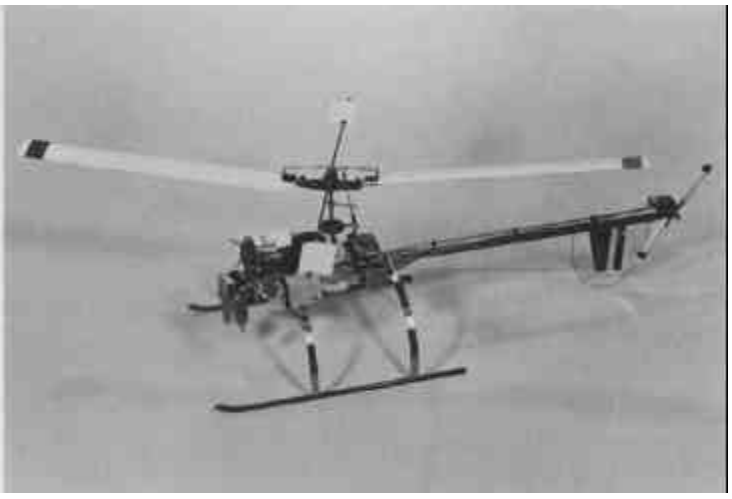
Close-up of tail rotor blade attachment. Nylon arm must be free to rotate between wheel collars.



View of tail rotor gear box looking directly into aft end of housing. Keep well lubricated.



Underside view of tail boom showing 4-40 gear box mounting screws. Access holes in bottom of boom.



The Polecat, ready to fly. And fly, it does! Take on a few of the .60 jobs and watch their envy!

POLECAT

from page 48

POLECAT PLANS

full size plans for the Polecat are available from R/C Modeler Magazine plans service. #566

aft to rebalance the paddle bar. (If one rotor blade is entirely too heavy, tape something to the light blade temporarily.) When satisfied, tighten that blade, now balance the rotor blades, i.e., drill holes in the end of the heavy blade or stick-pins or brads in the light blade. Twist the pitch in blades (bend the 3/32" blade holder not the ¼" head plate). Bend in the coning angle, using a straight edge on the bottom of the rotor head for a reference line. Recheck the pitch and correct, recheck the coning angle and correct, then repeat as necessary. Install the teeter springs, bend the blade spring holders as needed to get the blades at equal height. Balance the tail rotor blades and install.

Find a suitable plastic box (or make a plywood one) as small as possible to house your receiver, battery and switch, and prepare it with the necessary cutouts. Install the servos, noting that the throttle servo is inverted and the tail rotor servo is held with only 3 screws. You might have to trim one ear on the tail rotor servo to clear the bellcrank standoff mount bolt. The push-pull rod to the tail rotor bellcrank crosses over the tail boom between the first and second tail rotor drive standoffs. Use NyRod or nylon tubing with 1/32" M.W. for the tail rotor and throttle connections. Secure with straps made from ½ wide nylon strips and screw to the frame with #2 sheet metal screws. Use your favorite methods for rod ends. Install push rods from servos to swash plate bellcranks, and adjust so that the bellcranks are perpendicular (also the tail rotor bellcrank). Adjust the swash plate links so the fore and aft is level and the right-left is down approximately 1/16" on the left side. Note: The swash plate tips down in the direction of travel wanted, i.e., down in front to go forward, down on right side to go right. Adjust the 1/16" collars on the tail rotor collective pitch shaft for about 4° positive pitch, making sure not to bind up the rotating nylon piece with the collars. Set the swash plate level now and adjust the paddle bar pushrod so that the paddles are level. Ooops ... I forgot to route your servo wires to the receiver box (run right-left servo and tail rotor servo wires between the clutch shaft and main rotor shaft over the top of the frame). Pack everything away in the box and tape or screw the box together. Install the box on standoffs with double-sided tape, and also secure the servo wires with double-sided servo tape. Run the receiver antenna wire in a nylon tube secured to the skid. Gads! It ought to be done by now, so here's the last step. Check the machine balance, lift by the main bevel gear, next to the rotor shaft. Your chopper should be nose down slightly. Add weight as necessary. Oil all bearings and linkages, and grease gears (especially oil the Missing Links on the tail rotor blade holders).

Flight Trim:

Always hold the rotor head and start the engine at idle! (Low throttle, high throttle trim.) Put a brick on each skid, and do run up. Check for proper blade tracking, and adjust as necessary to get both rotor blades in the same plane. Use the training gear shown, or install ¼" dowels through the skids for first flights and training. Lift off slowly, adjust tail rotor to stop any yaw, and adjust the main rotor to stop unwanted roll and pitch. (Note: In wind, normal take-off will produce a slight roll to the right, so allow for stabilizing in the hover.) For beginners, learn tail rotor and throttle **first** in short hops. Use small amounts of control and stay down around 1 foot of altitude. In forward flight, the Polecat will track on main rotor only, and climb and dive like it has an elevator on it. For tight turns, coordinate the main and tail rotor control for better tracking. For expert types, the rotor lead-time is 1 ½" to 2". You're on you own; remember, if in trouble, add power (except when just learning) and GOOD HELIOPHITING (??). Completely assembled machines and all components, anodizing, or materials raw or finished, are available from the author: Dave Keats, 2014

Atlas Drive, Troy, Michigan, 48084.