



NEW ERA .40

Designed by Lee Renaud

Text by Tim Renaud

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

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

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 1/4" 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

NEW ERA .40

Designed By:

Lee Renaud

TYPE AIRCRAFT

Sport/Pattern

WINGSPAN

52 Inches

WING CHORD

10 1/4 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) 9 1/2" (W) 2 3/4" (H) 2 1/2"

STABILIZER SPAN

21 Inches

STABILIZER CHORD (inc. elev.)

5 7/8 Inch (Avg.)

STABILIZER AREA

123 Sq. In.

STAB AIRFOIL SECTION

Flat

STABILIZER LOCATION

Top Of Fuselage

VERTICAL FIN HEIGHT

6 3/8 Inches

VERTICAL FIN WIDTH (inc. rud.)

5 3/4" (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.

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.

(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.

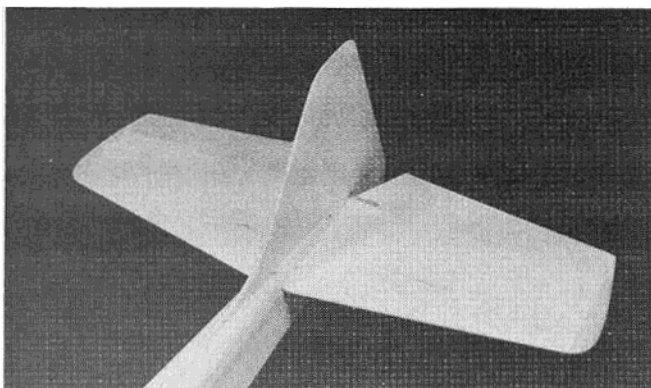
(2) Mark a centerline and the former locations on the 3/8" top block and pin it to the building board. Draw vertical centerlines on F-1, F-2A, and F-3, then glue them in place aligning the centerlines carefully and using a small square to ensure they are vertical.

(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.

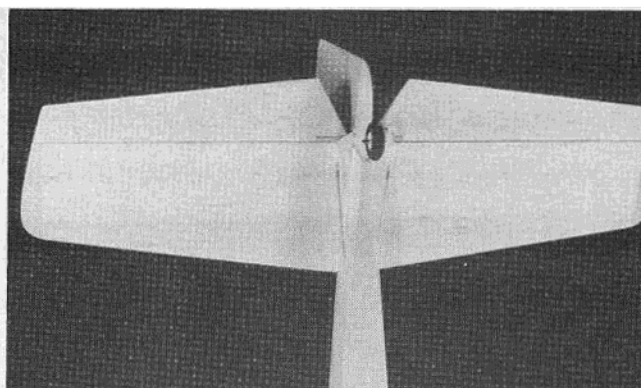
(4) Mark the former locations on the inside face of both 1/8" air-ply fuselage sides. **Making sure that you are making one right and one left side,** glue the 1/8" air-ply saddle doublers in place, checking the alignment carefully. Install the 5/16" x 1/4" T.E. stock tailpost on the left side **only**,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

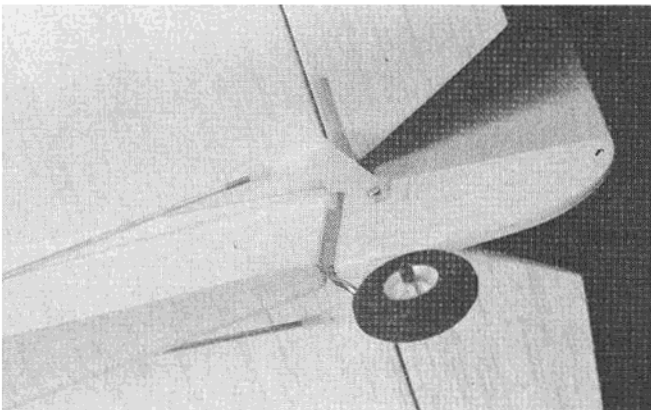
(6) Slide F-2B into the notches in the wing saddle doublers and glue in place. Cut and install the 1/8" x 1/4"



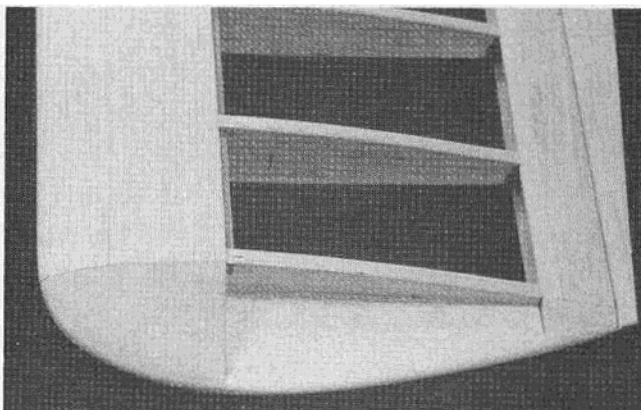
Tail surfaces pinned in place to check alignment prior to covering. Note how top block is shaped between fin and stab.



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



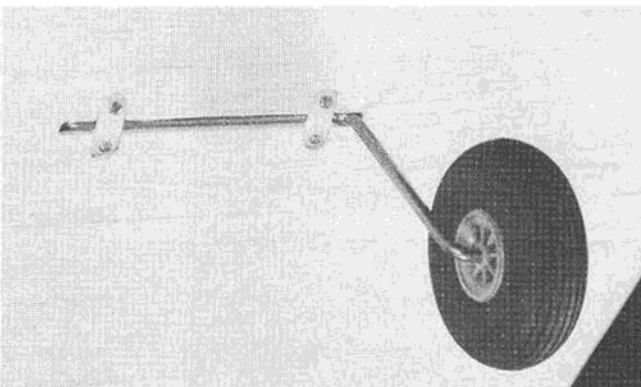
Detail of tail wheel installation. Aileron bearing is epoxied in fuselage. Tail wheel strut slips into ply horn mount. Simple and effective.



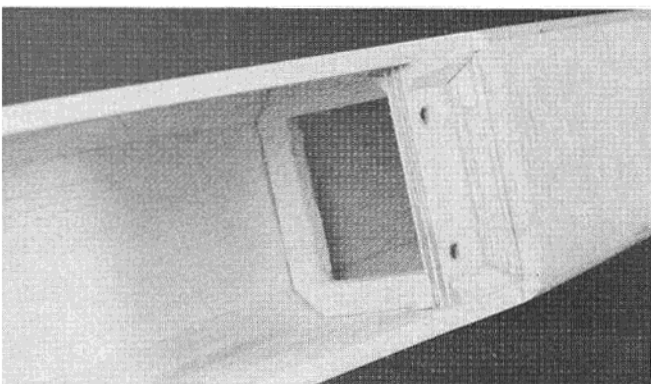
1/4" balsa wing tip with filler blocks. Top and bottom is easy to build and lighter than a solid block.



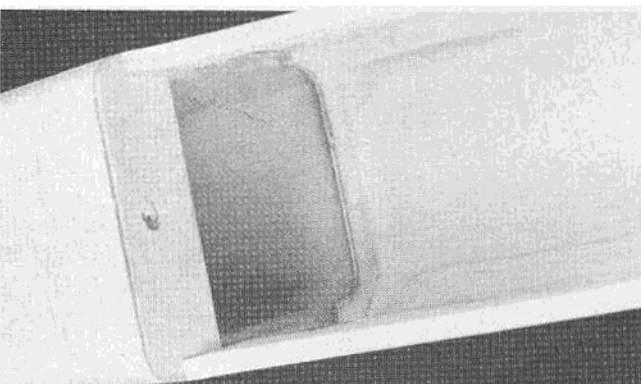
View of aileron bellcrank. Note that the pushrod from the servo goes in the second hole in, while the pushrod to the control horn goes in the outside hole.



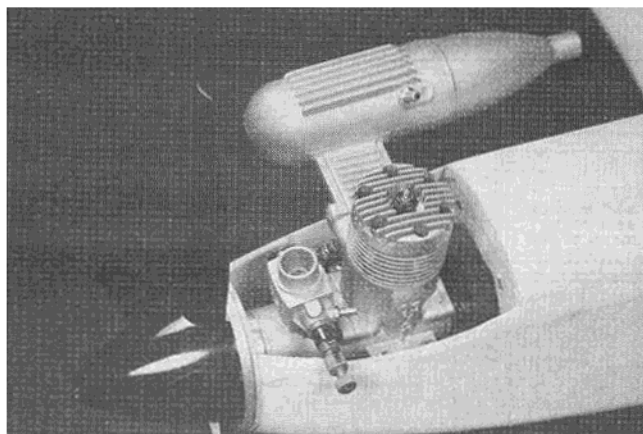
Main gear installation is quite conventional. Music wire gear leg fits into plywood trunnions and is retained by nylon straps and sheet metal screws.



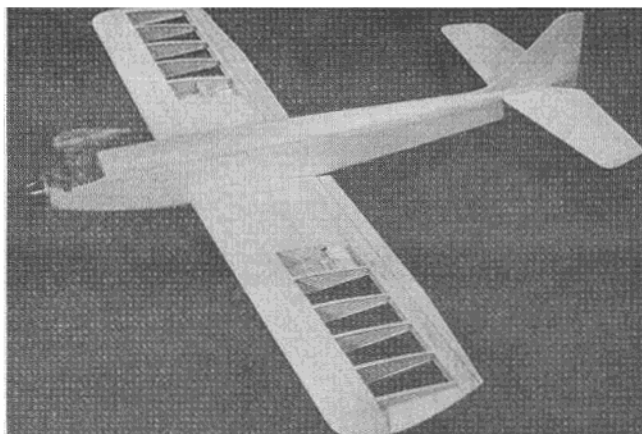
View of 1/4" plywood wing hold-down plate. Note the use of triangle stock reinforcing and the cut-out in F-3 for pushrod clearance.



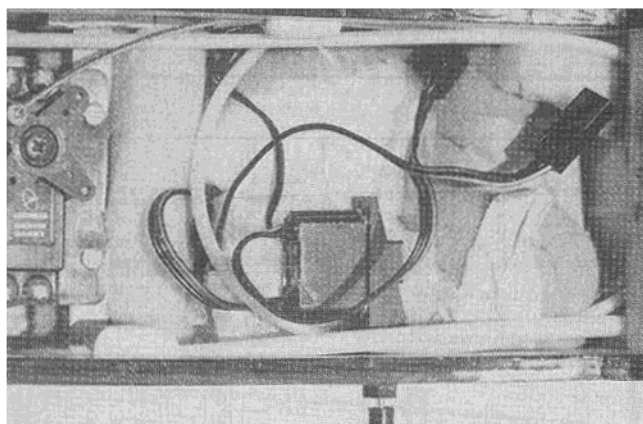
Close up of F-2A and F-2B in completed fuse. Note how F-2A has been cut out for 10 ounce tank.



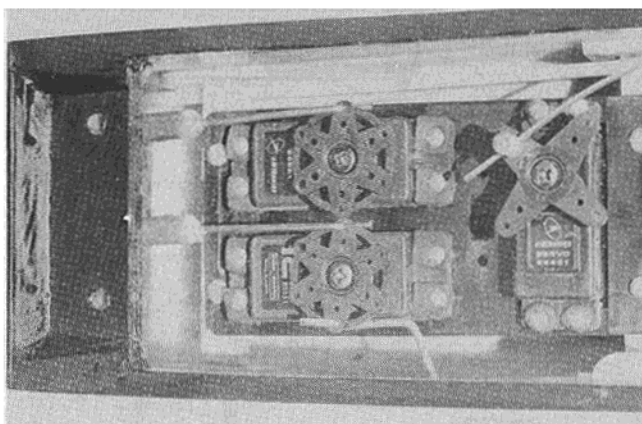
Close up of engine installation. Upright engine provides easy access to mounting screws and plumbing.



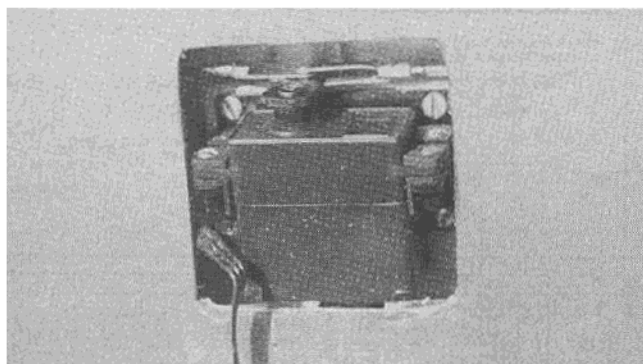
Completed airframe ready for final sanding and covering. Structure builds fast, light, and strong.



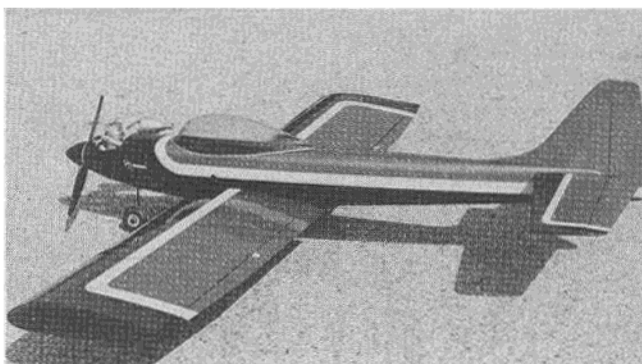
Receiver switch mounted in a Du-Bro switch mount. Makes a neat installation.



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 1/4" 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 1/4" 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

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 1/4" 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 3 1/2" 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 1/4" 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 1 1/8" 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.

