TACHIKAWA Ki-55 "IDA"

By David P. Andersen

Looking for something different for your next scale project? How about this great looking, super flying WWII Advanced Trainer?

The prototype Ida was completed in March 1938 and flew its maiden flight at Tachikawa airfield in Tokyo on April 20, 1938. It was designed to Japanese Army specifications which called for a two-seat monoplane to support Army ground forces. Primary requirements were extreme maneuverability at low altitudes and short-field performance from small, rough strips immediately behind front lines. Provisions were made for photographic and radio equipment in addition to bomb racks for light anti-personnel bombs. It was armed with a single forward-firing rifle

caliber machine gun in the cowl with a second rear-firing flexible gun for the observer.

To obtain the necessary low-speed handling characteristics, designer Ryokichi Endo chose a light airframe combined with a large wing area to achieve a low wing loading. A large tail provided stability and large control surfaces provided sensitivity. Downward visibility was enhanced by the sweepback of the wing with the bonus of added stability.

Wingspan was 38' 8". Max speed was 217 mph at 7000' and cruise speed was 146 mph.

Designated the Ki-36, Idas were assigned directly to Army ground units. During the Second Sino-Japanese conflict they were popular with ground commanders because of their ability to demoralize hard-pressed Chinese ground troops.

When the Pacific War began, the Ki-36s were no match for Allied fighters. From 1943 onwards, they were assigned to units in the interior of China, far from Allied aircraft. For this reason, the airplane is little known in the West.

It was the policy at the time to adapt operational aircraft designs to become trainers, rather than design entirely new aircraft as was the practice in the West. The good handling characteristics of the Ki-36 rendered it well suited for an advanced training role. All unnecessary equipment, including the wheel pants, were removed. Balloon tires were substituted for the original high-pressure tires. The result was the Ki-55, which was manufactured in large numbers by both Tachikawa and Kawasaki. Pilots received their training in civilian flying schools under military contracts as well as regular Army flying schools. Nearly all Army pilots received their wings only after soloing the Ki-55.

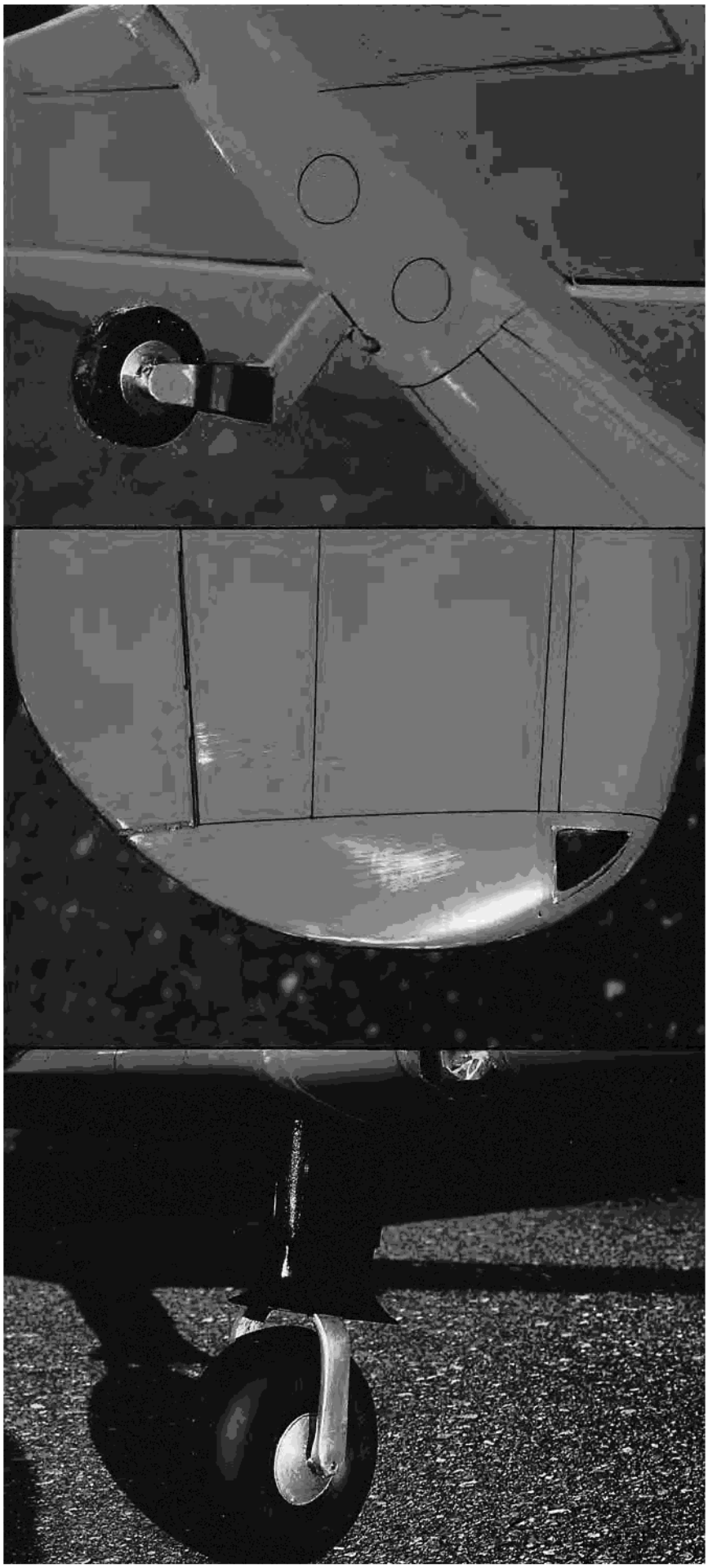
Production continued until January 1944 when desperate shortages of material and skilled workers (who were indiscriminately drafted) shifted production to high-performance aircraft for home defense. By then, a total of 2723 Idas had been built. During the last year of the war, the remaining Idas were expended in kamakazi sorties in which they carried a single externally mounted 250kg or 500kg bomb.

The simplicity and docile handling of the Ida are what we seek in a scale model aircraft. Designed around the O.S. 108 for reliability, the model presented here is an excellent choice for operation from small grass flying fields. It is just big enough to meet the IMAA criterion for giant scale. Its traditional wood construction is familiar to modelers with some scale model building

TACHIKAWA Ki-55 "IDA"

Designed By:
David P. Andersen
TYPE AIRCRAFT
Sport Scale (18% of full-size)
WINGSPAN
84 Inches
WING CHORD
12⅜ Inches (Avg.)
TOTAL WING AREA
1040 Sq. In.
WING LOCATION
Low Wing
AIRFOIL
Semi-Symmetrical
WING PLANFORM
Tapered L.E.
DIHEDRAL, EACH TIP
4 Inches
OVERALL FUSELAGE LENGTH
56 Inches
RADIO COMPARTMENT SIZE
(L) 12" x (W) 6" x (H) 3"
STABILIZER SPAN
28½ Inches
STABILIZER CHORD (incl. elev.)
7 Inches (Avg.)
STABILIZER AREA
200 Sq. In.
STAB AIRFOIL SECTION
Symmetrical
STABILIZER LOCATION
Mid-Fuselage
VERTICAL FIN HEIGHT
14½ Inches
VERTICAL FIN WIDTH (incl. rud.)
11½ Inches (Avg.)
REC. ENGINE SIZE
1.08 2-stroke
FUEL TANK SIZE
16 Oz.
LANDING GEAR
Conventional, fixed — no pants
MAIN WHEEL DIAMETER
5 Inches
REC. NO. OF CHANNELS
5
CONTROL FUNCTIONS
Rud., Elev., Throt., Ail, Flaps
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa & Ply
Empennage	Balsa
Wt. Ready To Fly	200 Ozs. (12½ Lbs.)
Wing Loading	28 Oz./Sq. Ft.



experience. It is well suited to casual sport flying as well as serious sport scale competition. The model was designed by enlarging the Koku-Fan drawings and filling in the structure, so all dimensions are exactly scale. By the addition of surface detail, it could be adapted to precision scale.

Long Ago and Far Away

When you arrive at the field, go quietly about your work. Speak to no one unless spoken to, then bow politely and say "O-hi-yo, cadet-pilot-san," for you are Saburo Watanabe, master flight instructor of the Imperial Army of Japan. Your mission today is to demonstrate for these recruits what they are expected to learn.

Fuel your Ida, test the controls, set the flaps up. Start the engine and remove the glow plug heater from the remote Headlock in the cockpit. Taxi to the end of the runway. Even though the grass is over two inches long and is soft and thick, the tail stays well planted on the ground without the need to hold up-elevator.

Turn into the wind and stop. Adjust the peak of your cap against the sun and wipe your oily hands on your pants. With hooded eyes survey the wind and the clouds beckoning you skyward. Announce "Take-off starting now" and advance the throttle slowly.

Steer with the rudder as Ida accelerates down the runway. The rudder is very effective so only a hint of right rudder is required to compensate for engine torque. (Actually, there are three other factors, in addition to engine torque, which cause a taildragger to tend to turn to the left on take-off. They are P-factor, precession, and spiral airflow. But we leave these for the ground school discussion.)

When there is sufficient airspeed, Ida will lift off by herself; we need only stand by and watch, ready to compensate for a crosswind gust with rudder, not aileron. Throttle back after initial climb and proceed in a shallow climb, turning crosswind, reducing power to cruise.

Relax your face --- by now it is fixed in a grin of pleasant anxiety. Assume a more serious demeanor in keeping with your exalted status lest these student pilots think you are enjoying this.

Approach the field for a fly-by. Lower partial flap, reduce power to 1/4 throttle and fly straight down the runway at 10' of altitude, then flick the flap switch up and simultaneously advance power to full, pull back on the stick, and steer with the rudder into a climbing Chandelle turn. You imagine the power flowing through the sticks to mark a thin trail of oil on the aircraft's passage up and away.

Approach the field again quietly at low power at a higher altitude this time. Push the loud-lever full forward and hold the nose down as she accelerates to full level flight speed. At the center of the runway pull 1/4 up-elevator and watch the big ship arch upward into a loop. Hold the wings level and correct any heading change with rudder if needed. Ease off the elevator at the top for

a brief moment of inverted flight then let the nose fall downward into an inverted dive. Reduce power to fast idle and ease in up-elevator to return to level flight. Glide to bleed off airspeed, then inch the throttle up to slow cruise.

You've thoroughly captured your student's attention now, so let's awe them with a combination of power, speed, and grace. Procedure-turn around 'way upwind and charge back to the field at full throttle. Starting with a slightly nose-high attitude, begin a very slow roll by moving the ailerons to the left about 1/8 full throw and hold. Prevent the roll from becoming a turn by immediately beginning to push down-elevator, adding it slowly until inverted, backing off as the nose descends through level to slightly down. Continue to hold left aileron throughout the roll, then release it suddenly when the wings become level, crisply stopping the roll. Reduce power to cruise. All of this should have taken 5 seconds and 500'.

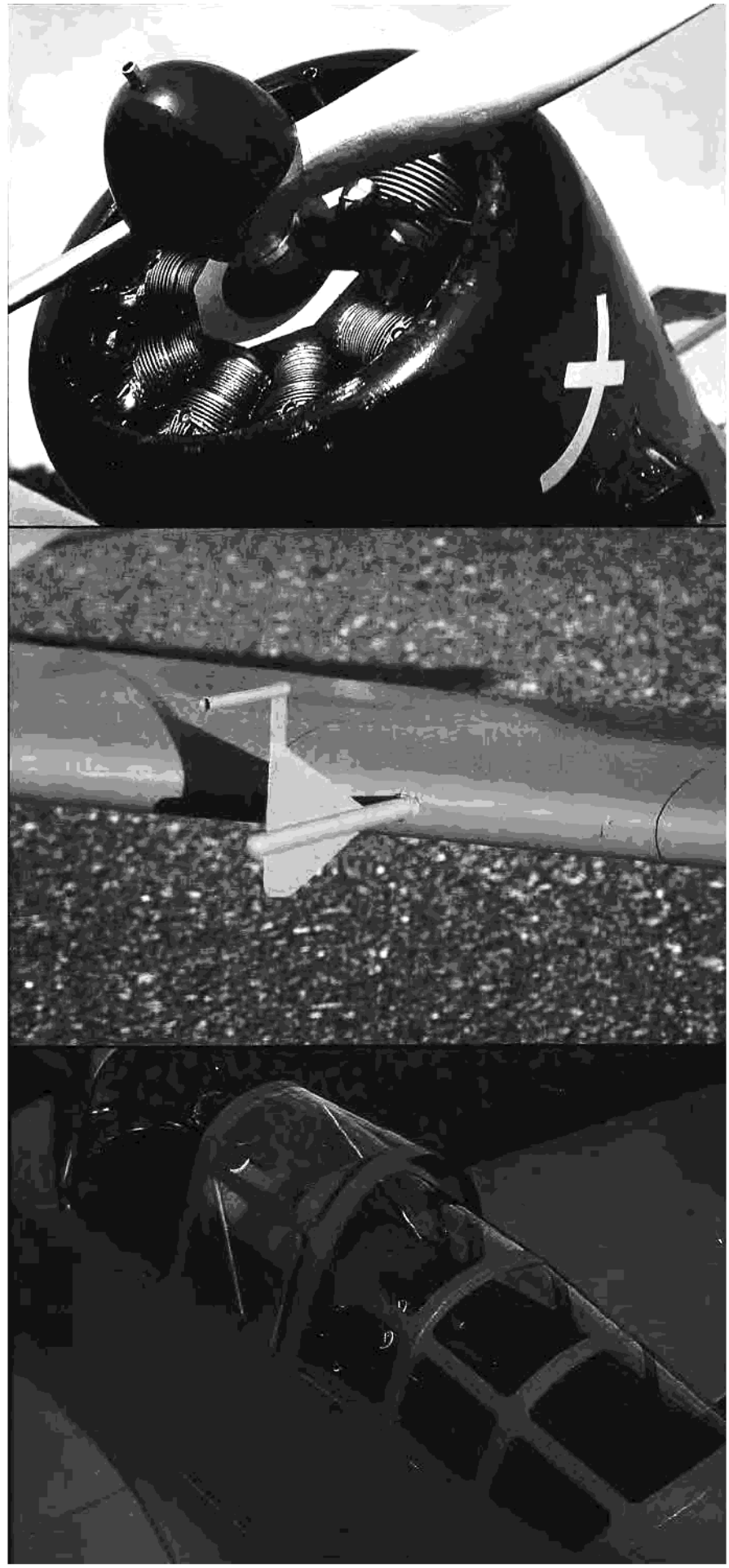
Just think of all the people who go through life without ever experiencing the thrill and the beauty of a well done slow roll. What a waste!

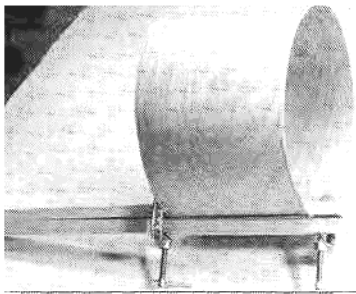
Climb to altitude for a spin. When nearly overhead, reduce throttle to fast idle and add up-elevator to maintain level flight as speed is reduced. When no longer able to hold a steady course, pull full up-elevator and boot full left rudder. Ida will fall off to the left into a spin, rotating slowly and descending slowly, nose pointed about 60° down. For safety, recover when at least three turns of altitude remain by neutralizing the controls. If properly trimmed, Ida will transition into a steep dive. If she continues to spin, your plane is tail-heavy --- apply power and down elevator to stop the spin. Let her dive to regain flying speed, then pull up-elevator. The danger here is that if the pull-out occurs before full flying speed is regained, Ida may go right back into another spin.

We leave our students begging for more. Reduce power in the traffic pattern, lowering partial flap in the downwind leg to full flap in the crosswind leg. Hold the nose down at all times with forward stick pressure if necessary. The flaps are so effective that the airplane will lose sufficient flying speed if the nose is allowed to be level at low throttle. Notice how Ida transitions into a steep glide without building airspeed. Control the glide angle with power to stretch the glide or down-elevator to steepen it. Flare for landing by relaxing elevator pressure. At ground contact, flick the flap switch up. This will kill lift to keep Ida solidly on the ground. Pull full up-elevator when well below flying speed to plant the tail wheel firmly on the ground.

Roll to a stop. Taxi back to the pits to answer questions from your students.

You wonder if they are worthy to become pilots for the Empire. You wonder if **you** are worthy to teach them. Time and destiny await. The Tachikawa Ki-55 Ida awaits.





1/16" ply cowl sheet is prebent by soaking in hot water and clamping. This simplifies attachment to cowl form.

One way or another, you know that this plane and its pilots will make history.

CONSTRUCTION

All parts should be cut from 4-6 lb./cu. ft. balsa unless otherwise stated. Refer to the construction photos as you proceed.

First, Install the Engine:

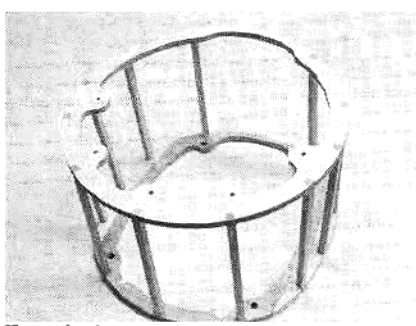
We commence construction with the fire wall because the cowl cannot be completed without it and the fire wall must be fit to the cowl before the fuselage can be constructed.

Cut the fire wall from 1/4" ply and, while you're at it, cut former F1, the two cowl rings, and the four engine mounts from 1/4" ply.

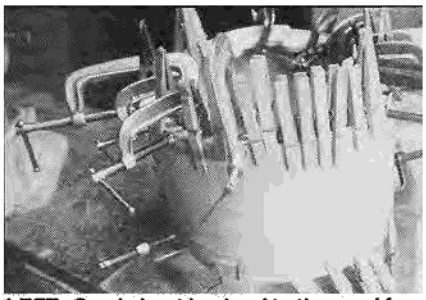
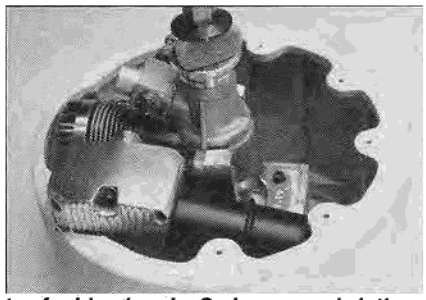
If you wish to install an engine other than the O.S. 108, such as the O.S. 120 Surpass, the width of the four ply engine mounts may have to be adjusted. If they are shortened much, then a tank support will have to be added inside the fuselage.

Using the engine mount as a guide, drill its mounting holes in the fire wall and install the blind nuts. The O.S. 108 doesn't need muffler pressure, so only a pickup tube and a fill tube are needed from the tank. Drill the tank feed holes, assemble the fuel tank and verify that the tank tubes can slide easily into the holes in the fire wall. Assemble the fire wall and the four engine mounts and epoxy these to F1 with lots of slow-cure epoxy. Notice that part of F1 is balsa. Why not all? The balsa sides are needed during construction of the cowl, but they will be removed after the cowl is completed. Balsa is easier to remove than ply. Verify that the tank slides through F1 and into the fire wall in a snug friction fit. Trim if too snug.

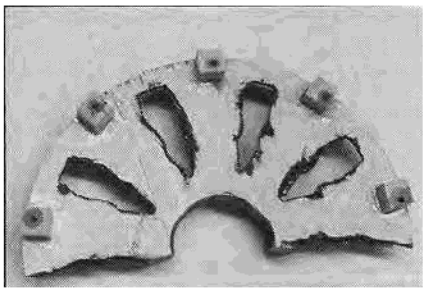
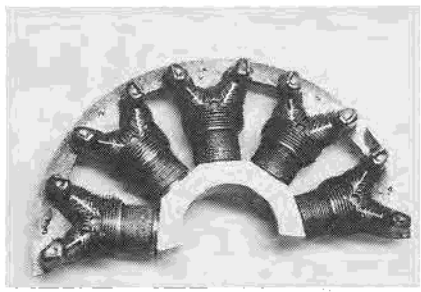
Now align the cowl base with F1 so that F1 is centered 1/32" below the top of the



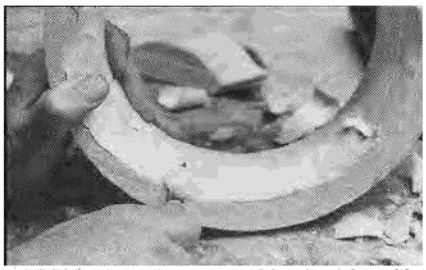
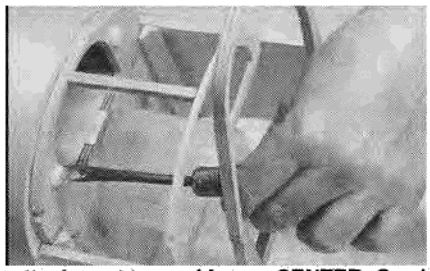
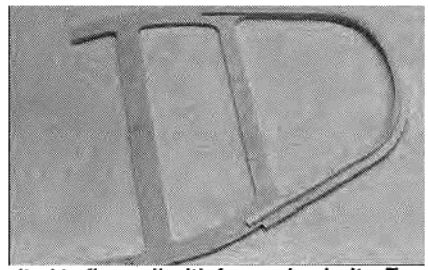
Two ply rings and balsa stringers form the cowl frame. The rear ring is threaded so it can be bolted to the fire wall.


LEFT: Cowl sheet is glued to the cowl form. Lots of rubber bands, C-clamps, and clothespins hold it while epoxy sets. CENTER: Engine is installed without a fuselage! It is bolted to the fire wall and fitted to the cowl. Cowl ring is trimmed as needed. RIGHT: Frame for dummy engine is fitted to forward cowl ring and drilled for six screws. Dummy engine diverts airflow over cylinder.


LEFT: Rear of dummy engine shows hardwood spacers, threaded for screws. Threads are hardened with CA glue. CENTER: Completed dummy engine is painted black, then lightly sprayed with silver. Result is oily metal look. RIGHT: Nosebowl is four pieces of balsa rounded with a razor plane using a template as a guide.

LEFT: Inside of nosebowl is chamfered before attachment to cowl frame. CENTER: Cowl is bolted to fire wall with four nylon bolts. Top two bolts are accessible through the cockpit. Lower two through wing saddle. RIGHT: Former F5 is assembled prior to installation. F5a supports canopy to rear.

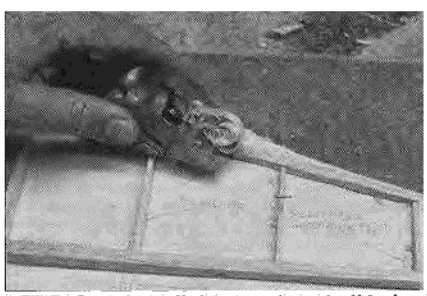
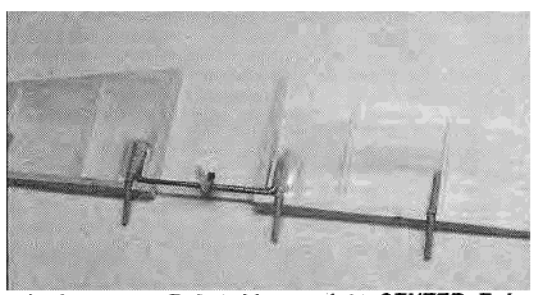
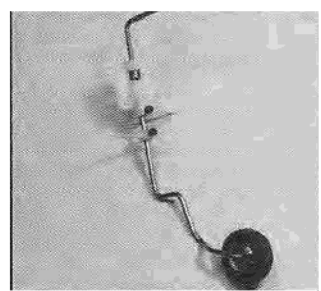
cowl base --- this clearance should make the finished cowl flush with the fuselage after sheeting. Clamp the cowl base to F1. Drill and tap the four cowl bolt holes. Note that the cowl base is tapped, not F1, because the cowl bolts will be driven from inside the fuselage. Harden the threads with CA, let cure, then chase the threads with the tap again to remove burrs. Bevel the inside of the holes in F1 to make them easier for the bolts to find. Verify an easy fit now for easy cowl attachment and removal later.

The cowl is a simple frame wrapped in plywood and rounded with a balsa nose bowl. The cowl is tough and easy to repair, doesn't crack or vibrate. Begin construction by cutting the ply cowl sheeting about 1/8'' oversize. Soak the cowl sheeting in very hot water until it becomes soft and easy to bend. Bend until the outer ends overlap and clamp them in position. Set aside to dry overnight. The bend will stay.

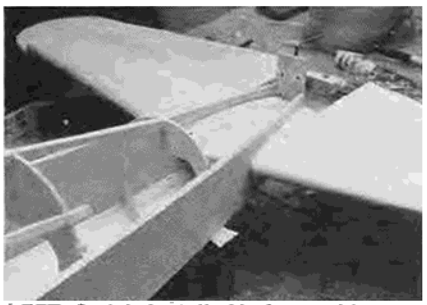
Cut 11 cowl stringers from 1/4'' sq. balsa, all exactly the same length, per the plans. Assemble the cowl frame with slow-set epoxy. Verify alignment with a triangle. Let cure and trim away the excess epoxy.

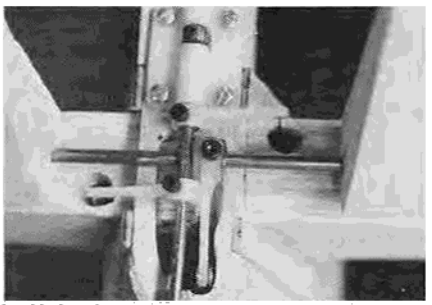
Coat the cowl frame with slow epoxy and wrap the cowl sheeting around the frame. The seam should be at the bottom, meeting in a butt gap with no overlap --- a small gap is okay. Strap, clamp, and wrap the sheeting to the cowl frame so that there are no gaps between the frame and the sheeting. When the epoxy has cured, trim the cowl sheeting flush with the frame with a razor plane.

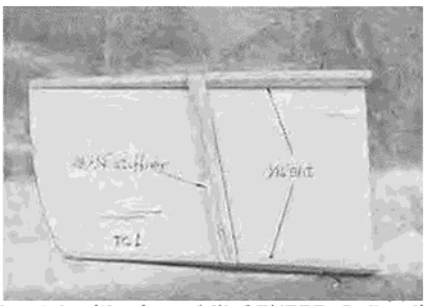
The cowl cannot be completed until the engine and muffler are fitted to the cowl.

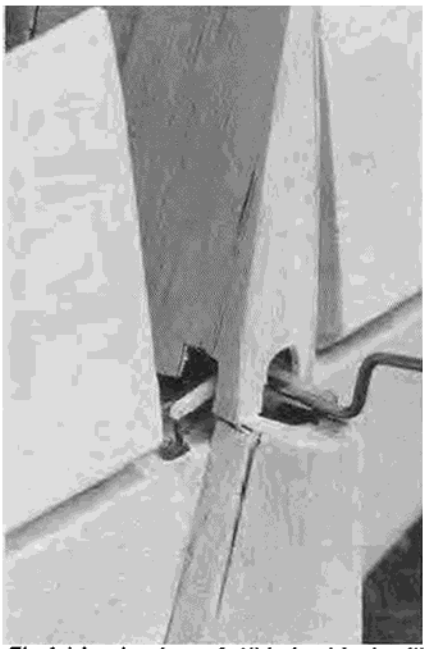
LEFT: Stab is built in two clamshell halves, notched to accept Robart hinge points. CENTER: Robart hinge points and elevator control horn are installed in elevator before assembly of the two halves. RIGHT: Tail wheel/rudder steering is Goldberg nose wheel strut with two steering arms.



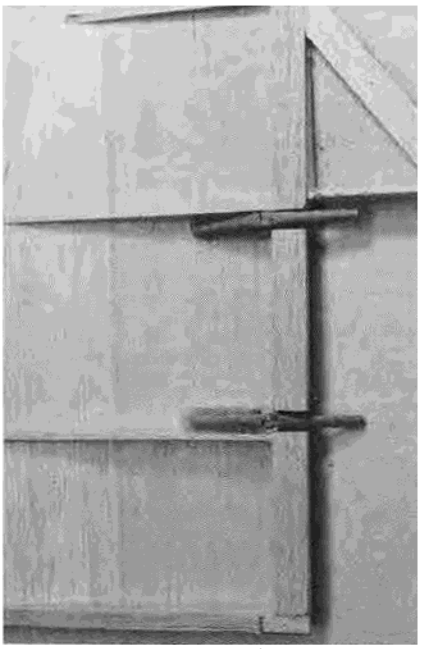




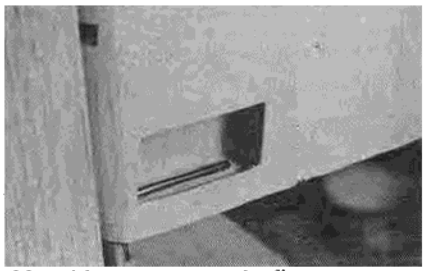
LEFT: Stab is installed before rudder assembly. Holes for rudder cables are drilled through the stab with a long drill. CENTER: Pull-pull cables for rudder/tail wheel, pushrod for elevator. Total of three nose wheel steering arms. No nose wheel in sight. RIGHT: Lightweight 1/16" sheet fairing covers tail steering stuff. Easy to cut away for repair.



Fin fairing in place. A 1" balsa block will complete the fairing. Ready for stab fairings.



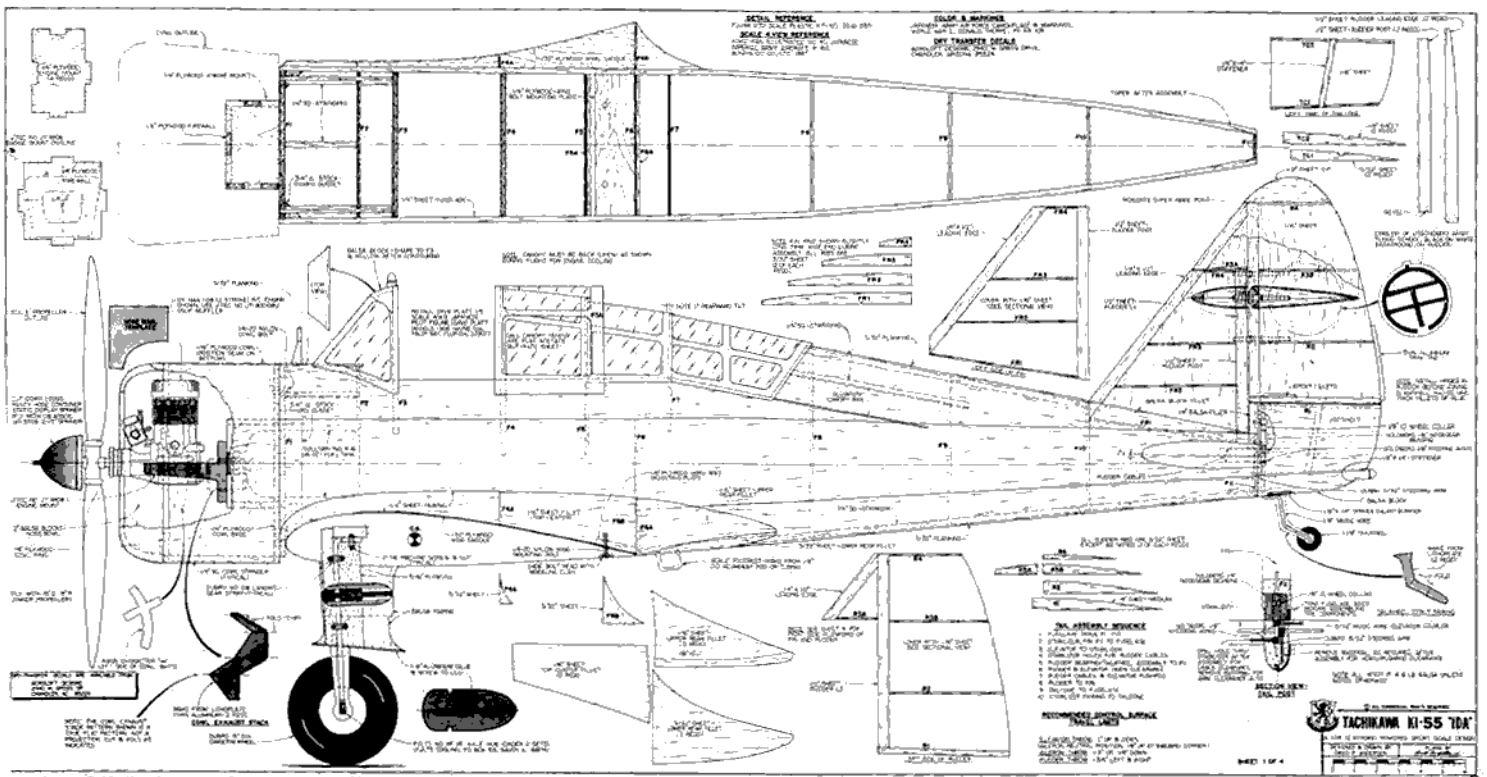
Rudder is built in two clamshell halves. Robart hinge points are epoxied in one before joining. Note recessed hinge line.



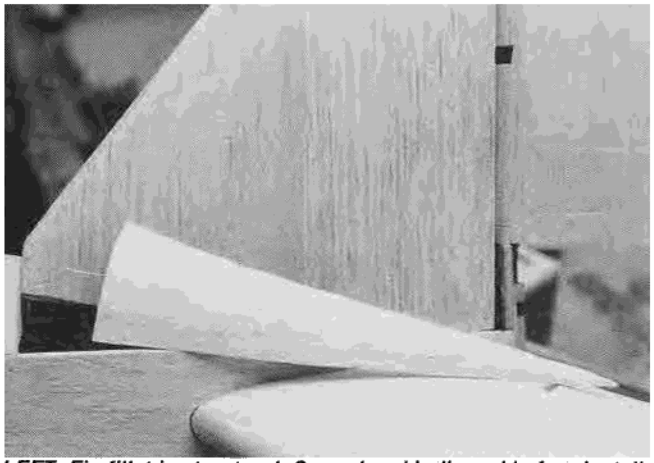
After hinging rudder to fin, an access hatch is cut in rudder, steering wire is secured with epoxy, hatch is replaced.

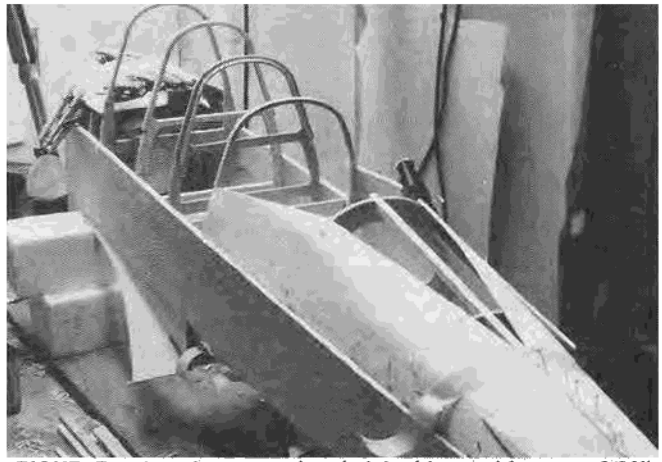
Attach the engine, with muffler, to the fire wall, face up on the workbench. Drop the cowl over the engine. Doesn't fit, I bet. Mark where the muffler meets the cowl frame, remove the cowl and trim. Repeat this process until the cowl fits and it can be bolted to F1 with the engine and muffler in place. Don't add the nose bowl until the dummy engine has been fit.

Assemble the frame for the dummy engine. The 1" stand-offs space the dummy engine's frame the correct distance in front of the forward cowl ring. Place the frame on



FULL SIZE PLANS AVAILABLE — SEE PAGE 158

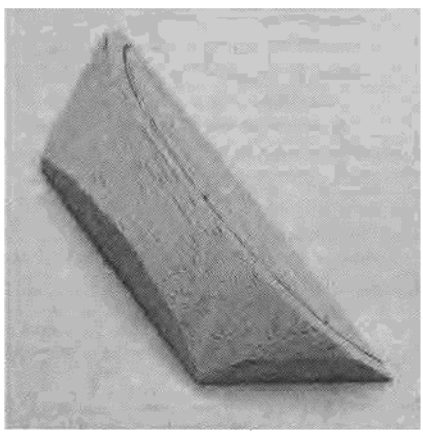


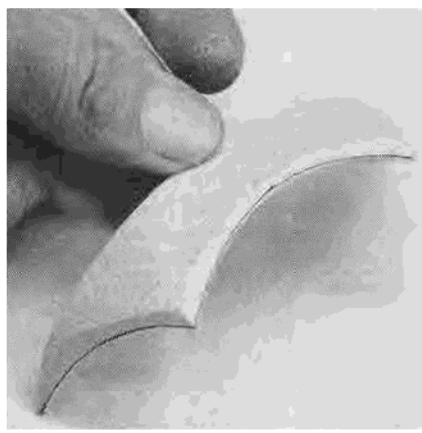


LEFT: Fin fillet is structural. Carved and hollowed before installation. RIGHT: Fuselage is conventional slab sides and formers; 3/32" sheeting top and bottom.

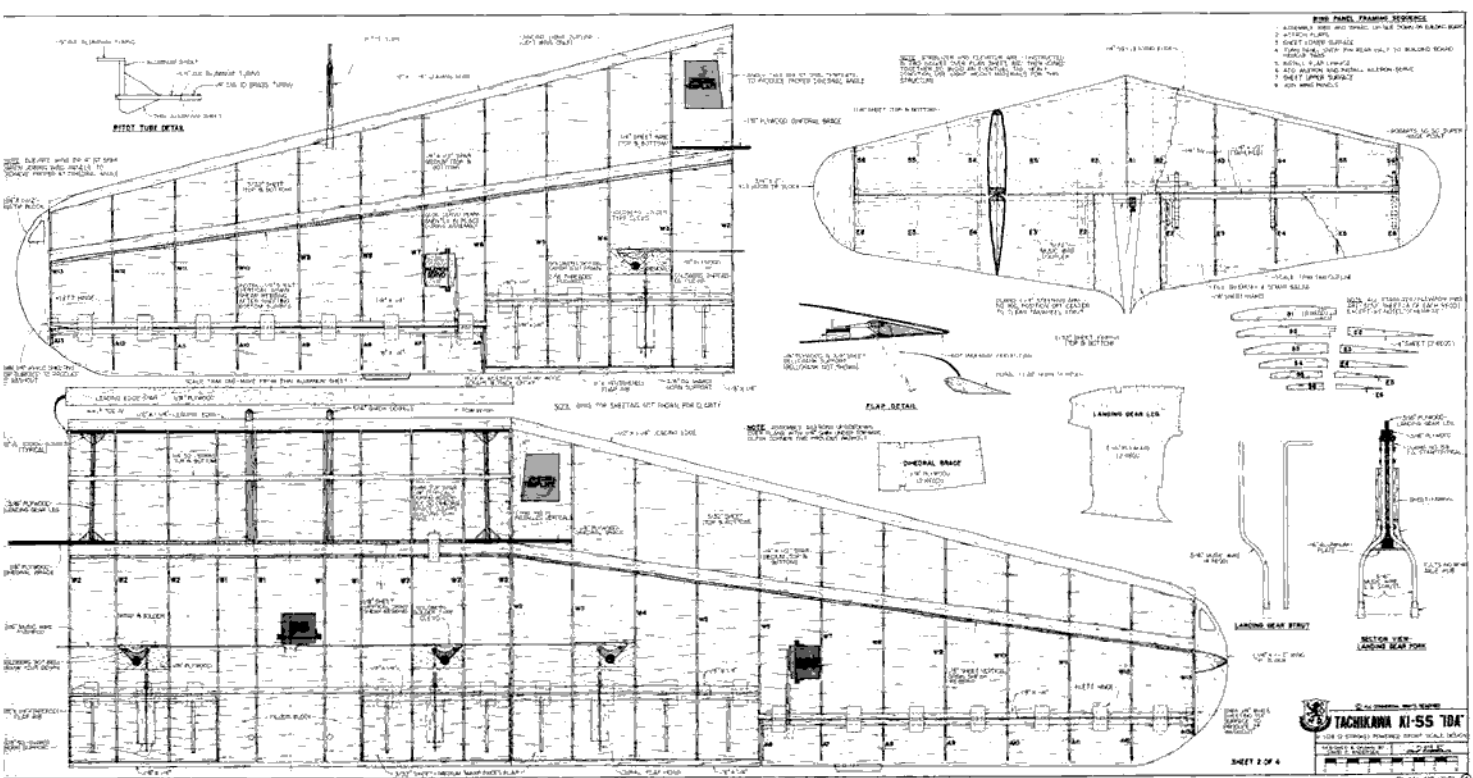
the cowl and drill through the spacers and through the cowl ring. Remove and drill the holes in the cowl ring a little larger to receive the six screws which will hold the dummy engine to the cowl frame. Remove the cowl from F1 and drive six screws from behind to attach the dummy engine frame to F1. Remove and harden the screw threads in the spacers with CA. Glue Williams Bros. 2" Wasp engine cylinders to the front of the frame with Zap-A-Dap-A-Doo (stupid name but works great for gluing plastic to wood). That completes the dummy engine except for painting.

Glue together the four pieces of the nose bowl with yellow wood glue. Round the nose bowl with a razor plane, occasionally testing the shape with the template provided on the plans. It need only be rough-carved at this point, final shaping and sanding should be done after attachment to the cowl. But first, hollow the inside of the nose bowl with an X-Acto knife and gouge so that the wood is approximately 3/8" thick. The balsa sidepieces of the cowl base may now be removed. The remaining holes for the cowl stacks and the engine exhaust are best cut after the base finish has been applied.

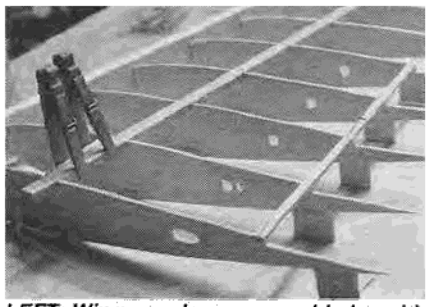


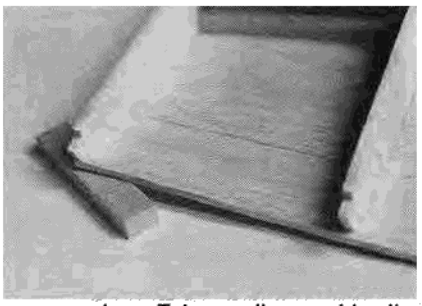


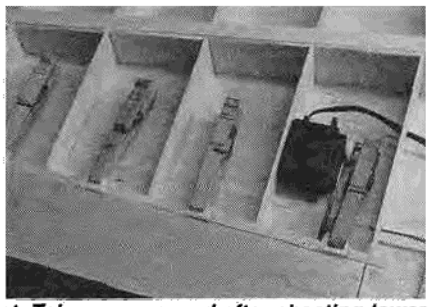
LEFT: Wind screen fairing is cut per top, front, and side views on a scroll saw. Then . . . RIGHT: . . . thinned with an X-Acto knife to 1/8" thickness. Glued to former F3.



FULL SIZE PLANS AVAILABLE — SEE PAGE 158







LEFT: Wing panels are assembled upside down over plans. Tabs on ribs provide alignment. Tabs are removed after sheeting lower surface. CENTER: Wing is weighted to a flat surface, last rib raised for washout --- very important. Then top surface is sheeted. RIGHT: Reversed clothespins hold Klett aileron hinges while R/C-56 glue sets. Aileron servo is permanently installed with Zap-A-Dap-A-Goo.

Fuselage:

The fuselage construction is simple and traditional --- 1/4'' sheet balsa sides with formers. Begin fuselage construction by cutting the fuselage sides and formers. Mark each former where it meets the fuselage side as shown on the plans. Note that formers F5 and F6 are composites of more than one piece. Assemble these now. It may be necessary to butt-glue several pieces of 1/4'' balsa sheet together to form the necessary width of the fuselage sides. Stack two 1/4'' sheet blanks, attached together with a few strips of Scotch double-faced tape. Trace the fuselage side pattern from the plans onto the top of the stack. Cut out with a scroll saw. Before separating, mark the edges for each of the former locations F1 through F11.

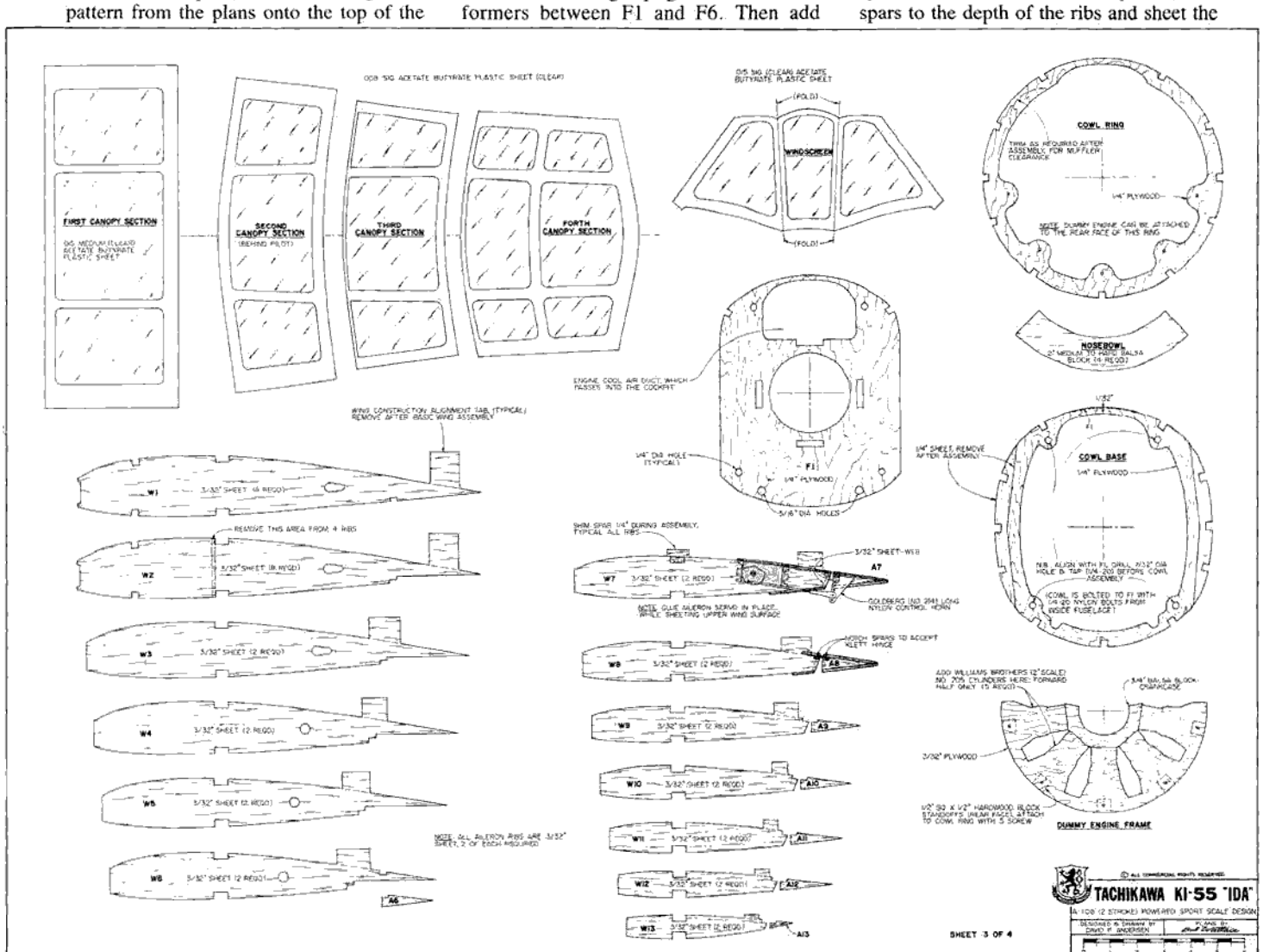
Begin fuselage assembly by laying one fuselage side flat on the workbench. Epoxy F1 in place. Verify that F1 is perpendicular to the fuselage side with a triangle. Reinforce with hard balsa gussets and epoxy. Similarly, add former F6. When dry, glue the other fuselage side in place on F1 and F6. Before the epoxy sets, verify that the rear ends meet without offset when brought together. Add weights on F1 and F6 while the epoxy sets.

Turn the fuselage upright and add all the formers between F1 and F6. Then add formers F8, F9, and F10 in that order as the fuselage sides are pulled together and held with masking tape until the glue dries. Add F7 last. Do **not** add F11 at this time. Set the fuselage aside while you build the stab.

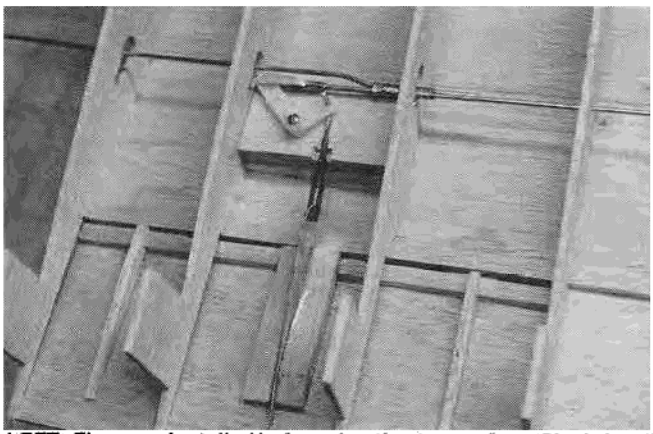
Stabilizer and Fin:

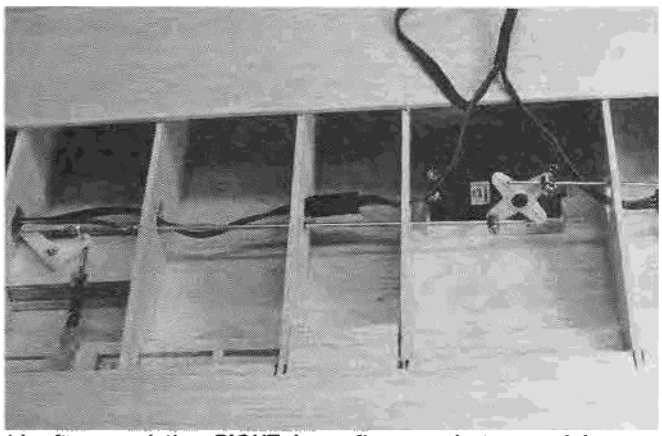
Ida has a rather short nose and a large tail. In order to avoid tail heaviness, the tail must be built and finished as lightly as possible. Use light materials throughout the tail.

The horizontal stabilizer and elevator are assembled over the plans which are protected with wax paper or Saran Wrap. Assemble the rear spar of the stab, front spar, and ribs. Plane the front spar and rear spars to the depth of the ribs and sheet the



FULL SIZE PLANS AVAILABLE — SEE PAGE 158





LEFT: Flaps are installed before sheeting top surface. Clevis is adjustable after completion. RIGHT: Large flaps require a powerful servo. Ace proportional retract servo is recommended.

structure with lightweight 1/16'' balsa. Build two stab halves, notching the rear spars where the Robart hinge points will be inserted. Glue the two stab halves together. The elevator is assembled in the same manner except the elevator horn and Robart hinges are epoxied in place before joining the two halves together. The fin and rudder are built in the same manner. Be careful not to glue the top block on the rudder backwards --- that's the kind of mistake I make. Don't forget to file a flat on the 5/32'' elevator horn wire where the setscrew in the elevator horn (actually a Goldberg nose gear steering arm) meets the wire. Use LockTite for good measure. We do not want the elevator arm to come loose.

Build the tail wheel and rudder steering assembly. File a flat on the wire where the setscrews in the two steering arms meet the wire. Add the wheel collar in the middle of the nose gear bearing. Use LockTite too for a permanent installation. Attach blind nuts to F11 for the nose gear bearing. Assemble the tail components in the following sequence:

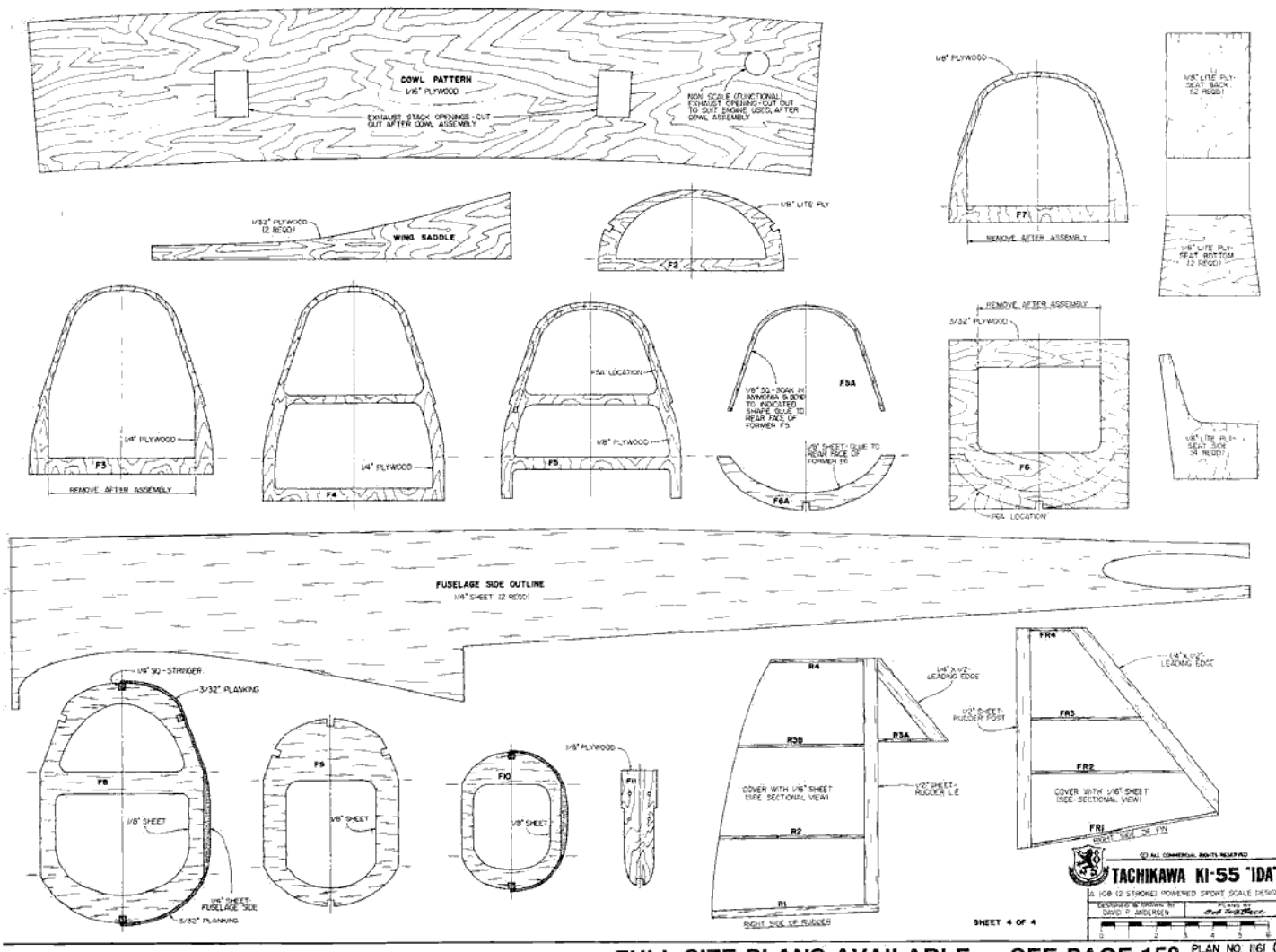
Glue stab in place. Add fin and F11 to fuselage.

Add elevator to stab by gluing hinges to stab with lots of R/C-56.

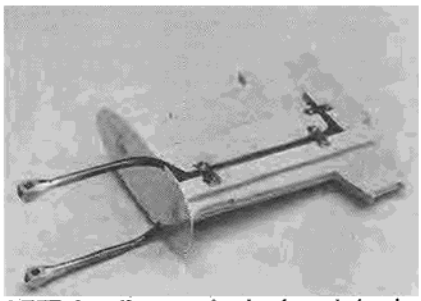
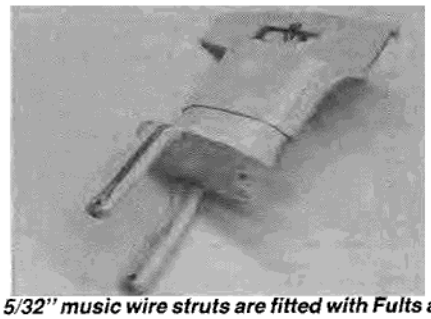
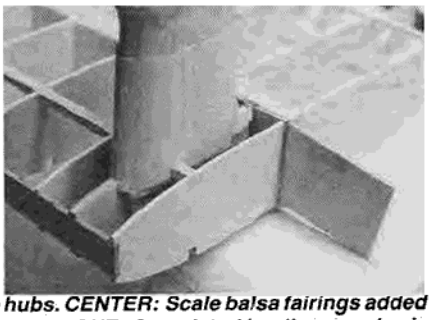
Drill holes all the way through the stab for rudder cables.

Bolt rudder steering assembly to F11. Fill its space between fin.

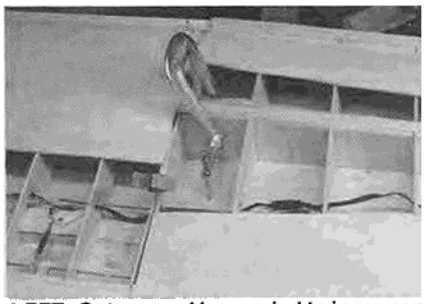
Remove material from F11 for the elevator horn travel. Remove material from

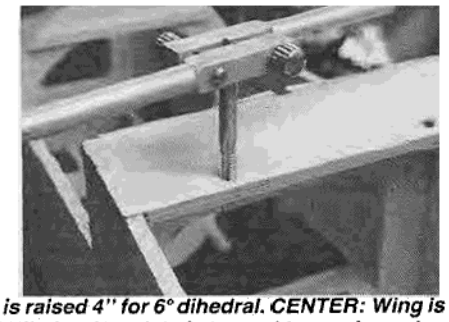


FULL SIZE PLANS AVAILABLE — SEE PAGE 158 PLAN NO. 1161 ④

LEFT: Landing gear leg is ply and aluminum; 5/32" music wire struts are fitted with Fults axle hubs. CENTER: Scale balsa fairings added to gear legs are nonstructural. Fairings are wrapped with Sig Coverall and attached with CA glue. RIGHT: Completed landing gear leg is added to outer wing panel, epoxied to spars and stringers, 1° toe-in is built in.





LEFT: Outer panel is epoxied to inner panel while upper surfaces are partially sheeted. Tip is raised 4" for 6° dihedral. CENTER: Wing is aligned to fuselage while clamped in place, then holes are drilled for wing bolts. RIGHT: 1/4" ply wing plate is tapped to receive nylon wing bolts. Threads are hardened with CA.

stab for rudder arm travel.

Add rudder cables --- Proctor cables crimped with swages.

Insert the elevator pushrod --- carbon fiber with solder clevis.

Attach the rudder to the fin by gluing its hinges with R/C-56. Cut a hatch in the rudder. Add balsa blocks and epoxy beside the rudder steering wire inside the rudder. Replace the hatch.

Add the tail cone fairing. Add the stab fairings.

Cut the fin fillet --- the inside curve taken from FR1, the side taken from the side view and the top traced with it in place. Remove from the fuselage and round to shape. Hollow the inside, removing half of the wood. Completely carve and sand to shape before gluing it in place.

Back to the Fuselage:

Make some device which is able to hold the fuselage in either an upright or inverted position --- a couple of foam blocks will do.

Add the stringers to the fuselage and sheet the fuselage with soft A-grain balsa sheet. This is quite straightforward.

Carve the fairing for the top of F3 in the following procedure.

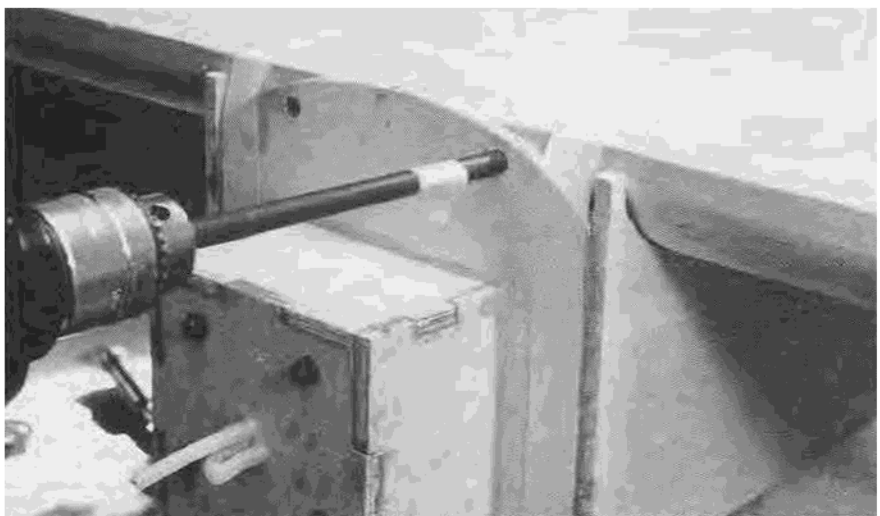
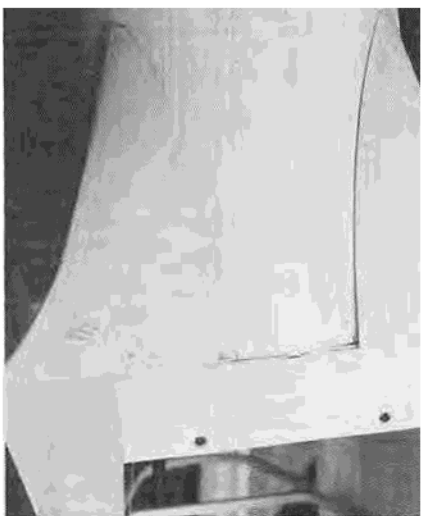
Select a rectangular block of balsa and mark the top view on it.

Cut out with a scroll saw and replace the pieces. Mark the side view and plane to shape. Place the part on F3. Trace the outline of the top of F3 on the part. Cut away with a knife or a scroll saw. Split the pieces and carve the inside away until the part is about 1/8" thick. Cut curves on the front and sides to the same shape as the windscreen pattern. Glue to F3 and sand smooth.

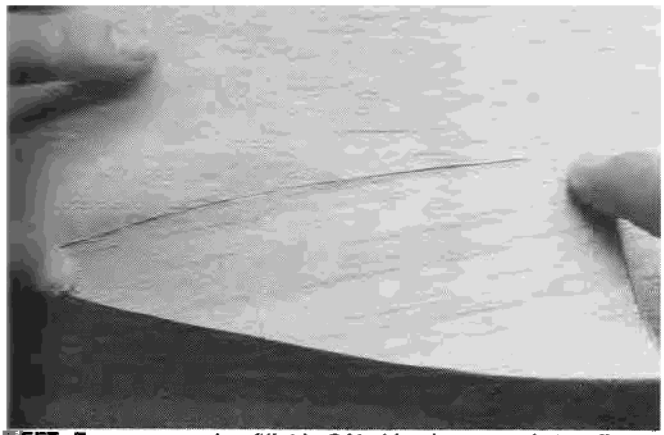
Main Gear and the Heavy-Wheel Theory

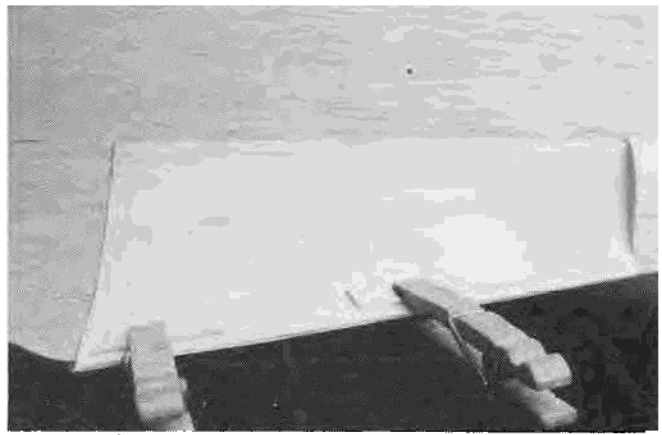
The main landing gear struts are the most highly stressed components of any airplane. For good ground handling, the gear must distribute stress from any direction but down. Crosswind landings present a side force which must not allow the wheel to twist. A totally rigid dual-strut gear with large balloon tires is an excellent combination for rough fields. 5 inch tires allow more than 1" of vertical shock travel --- more than twice that of oleo struts. Even some full-size airplanes use this formula --- Pete Bowers' Fly Baby, for example. The disadvantage is a somewhat greater tendency to bounce on a paved surface.

The Du-Bro wheel is rather heavy. But this helps in landings. When the wheels hit the ground the rebound pushes up, causing the nose to rotate, increasing the angle of

LEFT: Wing in place, holes are drilled for wing rods. Long 5/16" drill bit used. Tape on bit shows how deep to drill. RIGHT: Lower wing fillets are soft balsa sheet, CA'ed in place. Note direction of grain.





LEFT: Rear, upper wing fillet is CA'ed in place --- only two fingers are required. How could fillet making be any easier? RIGHT: Upper wing fillet is clamped in place while glue sets. All fillet patterns are shown on plans.

attack. A bounce results. A heavy wheel causes a reward pull as the ground contact overcomes the wheel's rotational inertia. This brief reward pull tends to cancel the rebound and less bounce occurs.

A heavy wheel helps on take-off too. When rolling on the ground tail-high, the weight of the wheel is borne by the ground, not the airframe. The wheel is not contributing to the Center of Gravity in this situation, so the plane is, in effect, tail heavy, making it want to lift off. But as soon as the plane tries to lift the wheel, the weight of the wheel moves the C.G. forward which counters the lift-off. A stable condition results in which the airplane stays on the ground until it has sufficient airspeed to fly.

Begin landing gear construction by bending the four music wire landing gear struts. Leave the struts a bit long, they will be cut to length later. A Breiten, K&S, or other wire bender is a required tool here. After bending, the wire can be made stiffer by relieving its internal stress. Do this by heating in a oven at 550° for 15 minutes. Turn off the oven and let the struts cool slowly. Attach the struts to the landing gear leg with ply spacers and metal landing gear straps. The straps must be bolted, not screwed, in place. The aluminum plate is notched for the wire struts --- this provides extra rearward support. The struts may now be cut to length and the axle hubs soldered in place. To assure perfect alignment, solder them with the axle in place. The axle should be exactly perpendicular to the leg — toe-in will be effected when the landing gear leg is installed in the wing. Now complete the shape of the landing gear by adding the balsa fairings. Carve and sand to shape. For durability, wrap the struts with Coverall, glass cloth, or whatever and soak with CA or resin. The landing gear legs are now ready to install in the wing.

Wing:

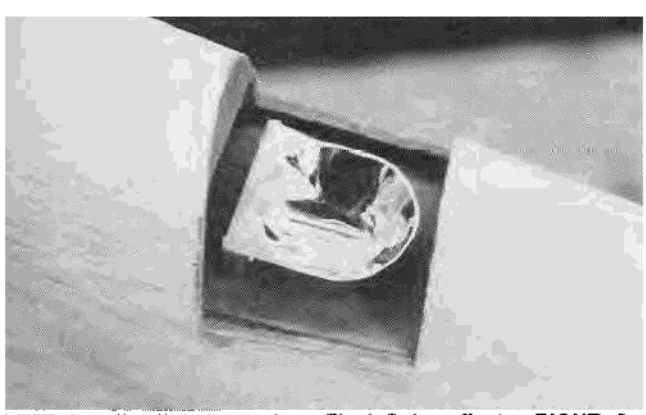
It is possible to build the wing without working flaps. If weight is kept within reason, it will land just fine. However, flaps allow really slow fly-bys, steep landing approaches without airspeed build-up, and take-offs in a short space, especially when there is no wind. I have flown Ida in fields too small even for high-wing trainers. Flying with flaps adds so much to the fun of flying, it would be a pity to not include them.

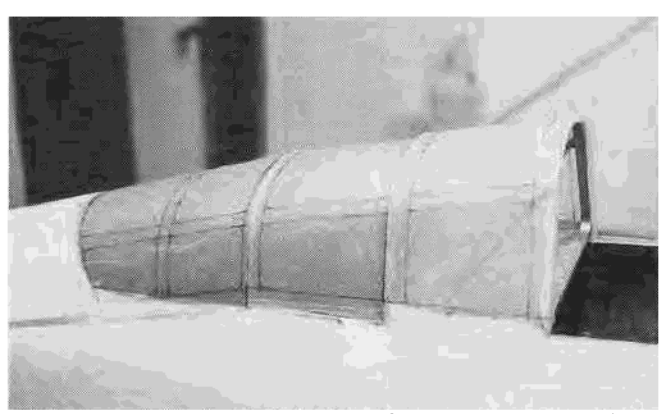
Ida's rather larger dihedral adds to her low speed stability and the sweepback in the leading edge acts somewhat like more dihedral. Nevertheless, 2° of washout (negative twist) in the wingtips are necessary to avoid tip stalls. This amount of washout was required in the full-size Ida too don't reduce it or one day you will snap-roll her into the ground.

Build the ailerons and flaps separately from the wing. The ailerons are built by pinning the top sheeting to the plans and raising the forward outer corner 1/8" with a scrap of balsa. This adds washout to the aileron. Glue the hinges in place with R/C-56. Glue the aileron ribs in place with yellow glue and add the precut lower sheeting, notching it to clear the aileron horn.

The center section and the outer panels are built separately and joined when partially sheeted. Assembly is done over the plans on a flat table. The top spar is laid down first, supported by a 1/4" shim so that the dihedral braces will clear the table. Glue the ribs in place, upside down, pinning to the board so that the tabs on the rear of each rib lies flat on the table. Notice how the tab of the outermost rib seems a little long. This builds in washout. Install the dihedral braces in the center section. Install the landing gear legs, epoxying well with hard balsa gussets. Note that the landing gear leg is installed as if it were just another wing rib but toed inboard by 1°. The 1° toe-in stabilizes low-speed ground tracking. The landing gear will be subject to strong sideways forces during crosswind landings --- the notches in the dihedral brace and the gussets in the leading edge support this. Install the flaps, but not the linkages, and sheet the entire lower surface (which is now the upper surface because the wing is upside down). Flip the panel over and pin or weight the rear half of the wing flat to the table. Add a 1/4" shim under the outer corner of the wingtip. This twists the tip for the correct amount of washout.

Add the shear webs and trailing edge





LEFT: Landing light is cut-down Flash Cube reflector. RIGHT: Canopy sections are covered with frisket film. Frames are cut away prior to painting.

clamp. Connect the flap linkage to the outer bellcrank, connect the aileron servo to the "Y" cable in the inner panel. Prevent the cable from rattling around inside the wing by spot gluing it with a few dabs of silicone glue. Complete the sheeting of the top surface. Add the wingtip blocks. Plane and sand the ailerons to final shape.

With the fuselage resting upside down, lay the wing in place. Align it with respect to the stab. If the wing is not exactly parallel to the stab, trim the fuselage sides (the ply wing saddles have not yet been added to the fuselage) until it is. Tape the front of the wing to the fuselage and clamp the trailing edge to fuselage former F6. (The photo shows two clamps --- the first clamps a wooden block to the inside of F6, the second clamps the wing to this block.) Measure the distance from the corners of the ailerons to the same point in the tail. Shift the wing until these distances are equal. Drill 13/64" holes through the wing trailing edge and through the wing mounting plate in the fuselage where the wing bolts will be. Remove the wing and tap the holes in the mounting plate with a 1/4-20 tap. Harden the threads with CA and chase them with the tap again. Enlarge the wing holes to 1/4" and harden them with CA. Recess these holes to the depth of the bolt head if you wish to hide the bolts. They can be filled with modeling clay and painted over for display, later removed by jamming a ball driver or screwdriver through the clay.

Place the wing on the fuselage again. Align the tips again and tape the leading edge in place. Using a long 5/16" drill bit, mark the depth from the tip of the drill to mid-spar on the drill with a piece of tape. This shows how far to drill. Now drill through the holes in former F1 to the depth of the tape. Remove the wing and glue 5/16" wing rods in these holes.

The ply wing saddles may now be added to the fuselage. Do this by adding yellow glue to where they will meet the fuselage sides and put them in place. Note how the fuselage sides are indented 1/32" in the region of the wing saddles to accommodate the ply wing saddles. With a layer of Saran Wrap on the wing so glue won't stick to it, bolt the wing on. Turn the airplane right side up. Tape the wing saddles to the surface of the wing so they will lie flat. Add fillet formers F4A and F6B. Why didn't we add the wing saddles before fitting the wing rods? We could have, but this makes a slightly tighter fit.

Wing Fillets:

The most common method to make fillets is to gob tons of epoxy-laden microballoons on and laboriously grind the stuff to shape. Life is too short for that. Wing fillets bear no stress so all that epoxy is just dead weight. Here's a better way.

Cut the lower wing fillets from balsa sheet and glue in place with CA. A slight bend near the rear is necessary to meet the curve of the fuselage. Hold in place with your fingers while the CA sets. What could be easier?

Cut the upper-rear wing fillet from 1/16" A-grain soft sheet. It should be very flexible. Bevel the edge to almost a feather edge. Put it in place and bend it to meet the lower fillet. It should be possible to do this with only two fingers. Attach to F6B first, then the fuselage, then CA it to the lower fillet.

The middle fillet is cut to shape, beveled, and glued in place. Epoxy can be used to attach it to the ply wing saddle. It is clamped in place with reversed clothespin until the glue sets.

The forward part of the wing fillet is solid balsa. Cut it to shape per the side view and glue in place. Carve to a concave shape with a woodcarver's gouge. Sand with sandpaper wrapped around a dowel.

Now isn't that a lot easier and better than grinding great gobs of epoxy?

Canopy:

The canopy looks complex at first glance, but it is only five flat sheets of plastic. No vacuum forming is required.

Before installing the canopy sections, prepare the base coat ready for color. Paint and complete the inside of the cockpit except for the pilot figure. Paint the lower rear corner where the rear canopy section will overlap the fuselage side so that the color will show through the canopy.

The windscreen is cut per the pattern on the plans and folded in two places. It is glued to F3 and the fairing on F3. Smooth the fairing-windscreen junction with epoxy filler.

Prepare the rear canopy sections by laying frisket film on clear Sig acetate plastic and tracing the patterns, including the frames, from the plans. Cut out with scissors, roughen where the plastic will contact the fuselage and glue in place, forward section first. R/C-56 works well, so does CA.

Unless your building is perfect and my drawing is perfect (the later is especially doubtful), the canopy frames which appear on the frisket film may not line up exactly from one section to the next but they should be very close. Redraw these if necessary with a flexible straightedge. Then cut through the frisket film on the frame lines with an X-Acto knife and straightedge. Remove the frisket over the canopy frames. Do the same with the first canopy section, without attaching it to the fuselage --- it will be glued in place after painting.

I chose a dope finish on the prototype, so I first brushed a thin layer of clear nitrate dope on the canopy frames as a primer. The first color to spray or brush on the frames must be the interior cockpit color, typically chromate green. Next, spray silver to prevent sunlight from shining through the frames. Then the color may be sprayed when the rest of the airplane is sprayed. Remove the remaining frisket film only after the final sealer clear coat has been applied and the edges have been [illegible] with the point of an X-Acto knife. [illegible] paint on the canopy frames tends to [illegible] them an edge which looks like metal. [illegible] the forward canopy section can be [illegible] position.

Dry-transfer decals are available from [illegible] Designs, 2940 W. Gregg Dr., Chandler, AZ [illegible]

Weight Check:

Weighing the completed airframe [illegible] covering is a good breakpoint to see [illegible] weight is accumulating. The complete[illegible] uncovered airframe without wheels or [illegible] except for aileron and flap servos, [illegible] engine and its mount and without [illegible] should weigh approximately 6¼ lbs. [illegible] half the final weight. If the weight of [illegible] airframe is considerably more than this, then you must use a very lightweight covering and finish. You should also ponder the cause of the excess weight and attempt to reduce it.

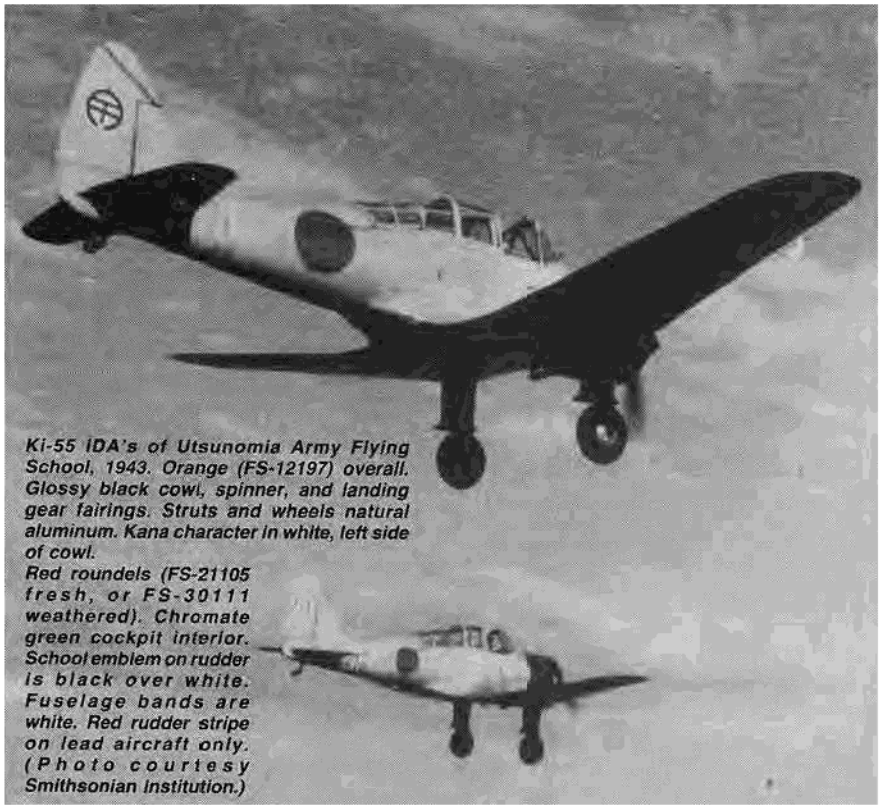
Color and Markings:

The prototype model used a very traditional silkspan and dope finish. This type of finish is very light, durable, and easy to repair.

Brush two coats of thinned nitrate dope on the bare wood. Dope wet medium weight silkspan on with thinned clear low-shrink butyrate dope (Sig Lite-Coat). When dry, brush two more coats of low-shrink butyrate. Then brush two thick coats of Sig sanding sealer. Let dry for two weeks and sand smooth. Spray silver all over. Silver dope covers very well, hiding wood grain, pencil marks, etc. Then spray the color. Orange covers well too. Only a half pint is needed for the entire airplane. To weather, scratch through the orange to expose the silver. Do this where you would expect the paint to be chipped or worn --- wing walks, near the cockpit where the pilot climbs in, leading edges, around access hatches, etc.

The emblem of the Utsonomiyo Flying School is painted as follows.

Before the final orange color is applied, spray white on the rudder. Let dry thoroughly. Meanwhile, trace the school's emblem from the plans onto frisket film. Cut the outline of the emblem with scissors, or, better yet, with an X-Acto knife in a compass. Peel off the backing and apply it to the rudder. Spray orange overall, but not enough to obscure the lines on the emblem. Cut away the part of the frisket which covers the black portion of the emblem with an X-Acto knife. Use a straightedge, compass, and a circle template to cut straight lines. Mask the outer edge of the emblem with vinyl tape and paper. Spray black. Peel away the remainder of the frisket film.



Ki-55 IDA's of Utsunomia Army Flying School, 1943. Orange (FS-12197) overall. Glossy black cowl, spinner, and landing gear fairings. Struts and wheels natural aluminum. Kana character in white, left side of cowl. Red roundels (FS-21105 fresh, or FS-30111 weathered). Chromate green cockpit interior. School emblem on rudder is black over white. Fuselage bands are white. Red rudder stripe on lead aircraft only. (Photo courtesy Smithsonian Institution.)

Panel lines are drawn with an extra fine Sharpie pen and a flexible ruler, using the Koku-Fan drawing as a guide.

The photo of the full-size Ida and the color documentation which accompanies it should be all you need for proof of color and markings. But several other in-flight photos of this airplane appear in "Japanese Army Air Force Camouflage and Markings World War II," by Donald W. Thorpe. Another appears in Koku-Fan illustrated No. 40 on page 151. The FS numbers refer to **U.S. Federal Standard 595B --- Colors Used in Government Procurement**. Color chips can be obtained by writing to the: General Services Administration, Federal Supply Service Bureau, Specification Section, 490 East L'Enfant Plaza S.W., Suite 8100, Washington, D.C. 20407.

The orange color is a perfect match to Sig Dark Orange dope. It also matches Sig's Supercoat iron-on covering. How convenient!

But the orange color may not please all tastes. My mother-in-law said of it "That's awful. It makes me dizzy and it makes my eyes hurt. It's gonna scare the birds and everything." But it's very visible under all sky conditions, especially full sun and a blue sky. She doesn't like my cat either.

Another color scheme is found on the cover of the 1/72" plastic model kit by Fujimi. It is lemon yellow and rusty maroon. The FS color numbers can be found in **IPMS Color Cross-Reference Guide** by David Klaus and an article, "Uncle Sam's Coloring Book," by Claude McCullough, which appeared in his Scale Views column in the Sept 1980 issue of R/C Modeler.

It's been said that nose heavy airplanes fly poorly but tail heavy airplanes fly only once. It is better to err on the nose heavy side. Balance 6" behind the leading edge at the root. Adjust the control surface throws as follows:

Elevator neutral position: 3/8" up at rear corner.

Elevator throw: 1" up and 1" down.

Rudder throw; 1¾" left and right.

Aileron neutral position: 1/8" up at inboard corner.

Aileron throw: 1/2" up, 1/4" down.

The raised aileron neutral position provides an extra measure of washout. For static display, push the aileron down. The raised elevator neutral position is necessary in order to maintain scale decalage. This position will cause a slight climb under full power, level flight at 1/3 throttle and a transition to a shallow glide at idle.

Please write to me in care of R/C Modeler, and tell me of your adventures with Ida. I will try to answer all questions and I will reply to all letters. Include a photo of your Ida. If you discover other color documentation, please tell me about it so that I can pass it on to others.

My thanks to Eric Malkerson, many of whose ideas were included in this design.□

From RCModeler Feb. 1994