

Aichi

M6A1



By Ed Westwood

LeeAnn Westwood holding her Dad's latest creation — the Aichi M6A1 Seiran.

WWII Japanese Float Plane For .25-.32 Power

Seiran



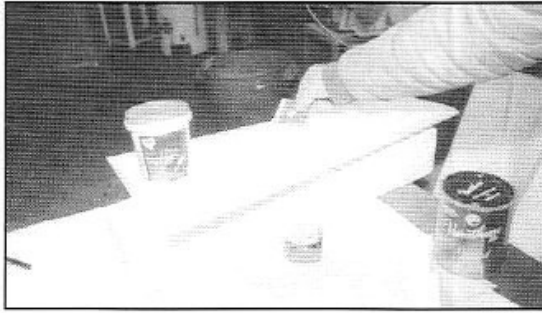
AICHI M6A1 SEIRAN

Designed by:
Ed Westwood
TYPE AIRCRAFT
Scale WWII Japanese Seaplane
WINGSPAN
53 Inches
WING CHORD
10 Inches (Avg.)
TOTAL WING AREA
475 Sq. In.
WING LOCATION
Low Wing
AIRFOIL
Root: S 8037; Tip: S 4233
WING PLANFORM
Tapered
DIHEDRAL, EACH TIP
5 Degrees
OVERALL FUSELAGE LENGTH
40 Inches

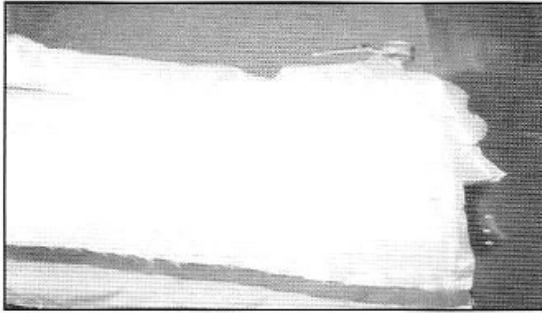
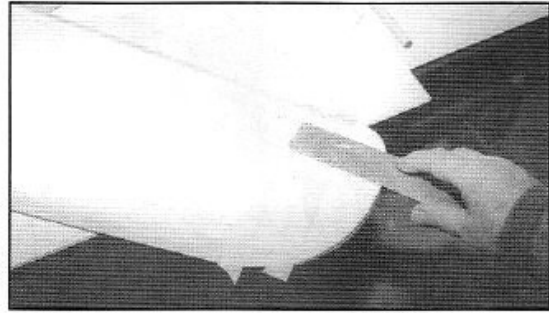
RADIO COMPARTMENT SIZE
9-1/4" (L) x 2-1/2" (W) x 2-1/2" (H)
STABILIZER SPAN
20 Inches
STABILIZER CHORD (inc. elev.)
5-3/8 Inches (Avg.)
STABILIZER AREA
110 Sq. In.
STAB AIRFOIL SECTION
NACA 0009
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
10 Inches
VERTICAL FIN WIDTH (inc. rud.)
7 Inches (Avg.)
REC. ENGINE SIZE
.25-.32 2-Stroke
FUEL TANK SIZE
4 Oz.
LANDING GEAR
Twin Floats

REC. NO. OF CHANNELS
4; 5 if bomb drop is used
CONTROL FUNCTIONS
Rud., Elev., Throt., Ail., Opt. Bomb Drop
C.G. (from L.E.)
25% MAC (3" from L.E. at fuselage side)
ELEVATOR THROWS
5/16" Up — 5/16" Down
AILERON THROWS
3/16" Up — 3/16" Down
RUDDER THROWS
1/2" Left — 1/2" Right
SIDETHRUST
1-1/2" Right
DOWNTHRUST/UPTHRUST
None

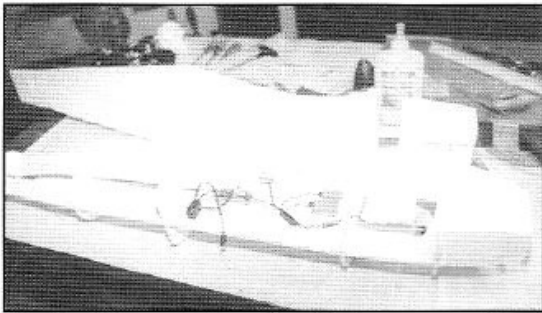
BASIC MATERIALS USED IN CONSTRUCTION
Foam, Fiberglass with water-based
Varathane (see Materials List)
Wt. Ready To Fly 80 Oz. (5 Lbs.)
Wing Loading 24 Oz./Sq. Ft.



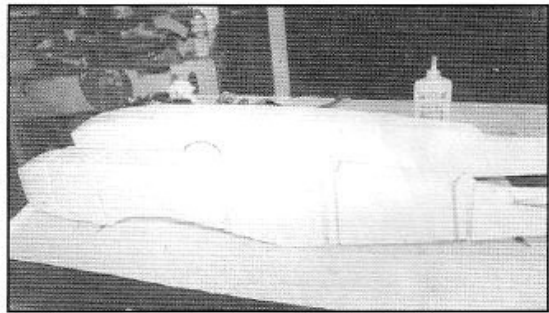
LEFT: Balsa-foam joining line is filled with lightweight spackling compound and smoothed with credit card. **RIGHT:** Masking tape holds separated aileron in place while tip is formed with sanding file. The tape also keeps tip airfoil from being sanded down.



LEFT: Top wing surface being glassed using 1-1/2 oz. glass cloth and water-based Varathane. **RIGHT:** Here, 1-1/2 oz. glass is being "painted" on to vertical fin; finished wing half behind.



LEFT: Partially assembled foam board fuselage complete with radio, switch harness, battery (tank beneath), and rudder/elevator servos. Switch pin and charge jack are accessed through canopy. **RIGHT:** Foam blocks fitted between bulkheads ready for sanding to shape.



One of the most bizarre strategic concepts of WWII was the use by the Japanese of submarine-launched aircraft against Oregon and, had it been successful, the Panama Canal. After the bombing of Oregon forests early in the war by submarine-launched seaplanes, their Navy developed even larger submarines capable of launching three seaplanes each and were dedicated totally to bombing the west coast of the United States and Panama. This program proceeded to the operational phase and three 400 foot submarines equipped with three Aichi M6A1 Seirans each, and were on their way when the war ended. These subs were bigger than destroyers! The aircraft were folded up in 12 foot diameter hangars built into the submarines.

Each Seiran could be assembled and be ready for catapult launch in 6 minutes. They were capable of carrying either an 800 Kg bomb or torpedo. Additionally, the launching frame was attached to the aircraft fuselage which allowed them to be catapulted with or without the floats. The floats were dropable in flight if the mission dictated crash landing near the subs for crew recovery only. Obviously, the planes could be sent on one way missions too. The reason for floats was of course for testing and training and in case of multiple missions requiring recovery and re-use.

I found the ship interesting from a scale model seaplane concept due to its large tail surfaces, twin floats, and generally pleasing appearance. Additionally, I was looking for a

project to test some new construction concepts. This ship is constructed mostly of glass-covered foam. Water-based Varathane® was used to stick the 1-1/2 oz. glass to the foam. I used 1 lb./cu. ft. white foam either hot wired or sanded to shape. Of course some light plywood, hardwood engine mounts, servo bearers, and balsa leading and trailing edges were used in addition to the foam parts.

CONSTRUCTION

Most of us modelers have used foam. Some, of course, have even built entire ships of the stuff. Covering it with glass stuck down with water-based Varathane is the lightest surface finish I've found yet. Unlike epoxy which solidifies but does not dry, a few coats



LEFT: Sanding fuselage foam blocks with coarse sanding block. This must be done with care to avoid digging out foam beads. **RIGHT:** Painting on the 1-1/2 oz. glass with water-based Varathane. A few laps won't matter — they are hardly noticeable after final painting.



LEFT: 3/16" dowel pins are glued in tapped wing hold-down block for added strength. Note cedar canopy plug in background. **RIGHT:** Pieces of 1 liter soda bottles are pulled around canopy plug to form windows. Hole in plug allowed for switch pin during fitting plug to fuselage.



LEFT: After canopy frame was formed with two layers of 3 oz. glass over waxed plug, windows were cut out and frame painted. Windows were glued in last. **RIGHT:** Cutting foam blocks to shape for floats.

of Varathane adds almost no weight. The first thing one must do is select and size the foam blocks. Foam cutting hot-wire equipment and a bandsaw are a must for this project. I used 1 lb./cu. ft. expanded bead styrofoam. In hindsight, blue construction insulation foam hot-wires smoother for the wings and tail surfaces but it is also twice as heavy and somewhat more difficult to carve and sand. The biggest problem with smoothing expanded bead foam is digging out the individual beads leaving voids. I found hot-wiring to approximate shape and using 100 grit sanding blocks minimized this tendency.

Wings:

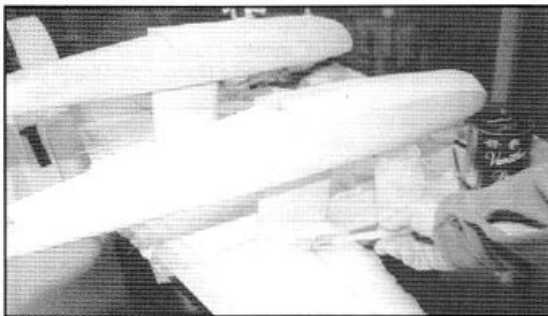
Start with foam blocks sized to the planform sans the leading and trailing edges. Put on the root and tip rib

templates and hot-wire one surface. Setting the cut surface back in the flashing, turn the wing over and cut the other surface. Save the flashing to hold the parts true while doing other stuff to them like cutting the spar slots and beveling the roots. Now set your bandsaw to 5° and cut the root dihedral bevels. Next, slot the wings for the 1/8" x 1/4" spruce spar caps. I made a slotter out of some #12 copper wire inserted in my soldering gun. I laid a straightedge on one side of the spar cap line and ran the slotter down the wing, alternately triggering the gun to get the right heat. Try this on a piece of scrap first to get the hang of how much heat to use. Attach the leading and trailing edges with Tite-Bond. Rubber bands will hold them in place while drying.

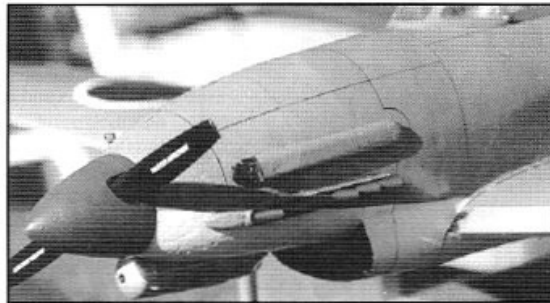
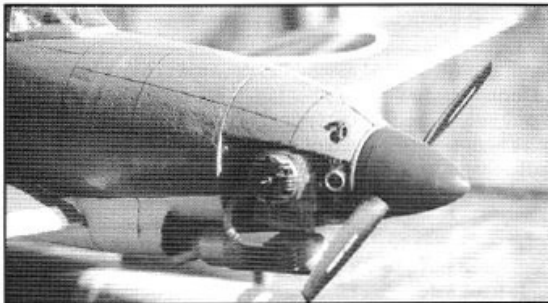
When dry, lay the cores in their respective flashing to sand the LE's and TE's to match the wing contours. At this point you might want to cut a slot in the lower surface for a buried antenna. If so, get out your slotter and cut a "J" shaped slot but don't install it yet. Cut out the wing joining doubler and slot the wing roots under the spar cap troughs to fit the doubler. Now, measure out from the root 7" at the top and 7" at the bottom and mark the wings. This is the float pylon cut mark. Remember, by marking both the top and bottom you should get pretty close to the right angle for the pylons to be vertical when installed. When you finally make the slots, only some minor adjustments should be necessary. You can Tite-Bond in the upper spar caps



LEFT: Here, 1/8" lite ply is being attached to float keel prior to attaching other side with Tite-Bond glue. **RIGHT:** Lower spar cap slot is being cleaned out with 1/4" wide sanding bar prior to sliding cap through float pylon and securing.



LEFT: 1-1/2 oz. glass is painted on to wing underside. Note: aileron is "V" slotted on bottom and held in place with masking tape and a few pins. **RIGHT:** Author found the scale floats larger than necessary. The construction drawings have smaller floats with about 20% less buoyancy and better performance!



LEFT: An O.S. .32 with stock muffler provides plenty of power. Note removable top portion of cowl. **RIGHT:** Some simple detailing adds much to the finished model.

now. Cut the foam tips out and roughly contour them before attaching. I found applying masking tape to the wing side of the attach joint keeps one from digging into the wing while sanding the tip. Now attach the two wings using the doubler under the upper caps. Do not glue in the lower caps. These and the hidden antenna are installed after the float pylons are attached and aligned for vertical.

Fuselage and Floats:

Cut out the fuselage and float profiles from 3/16" foam board (available from most craft stores). Cut and glue on the bulkhead semi-circular pieces. Next, cut out and install the fuel tank, elevator, rudder, engine servos, and switch. The switch is actuated by a pin extension up through the canopy.

Now, connect up the R/X and activate the system to get all the servos to neutral. Connect up the elevator, rudder, and engine pushrods and be sure everything works. The foam side pieces can now be temporarily installed, one at a time, marked, removed, and roughly contoured with a bandsaw, then glued in place. Be sure to check for longitudinal alignment here. Only one side in the engine compartment is glued in permanently, the other is removable to expose the hardwood engine bearers. These, by the way, must be drilled for your engine and epoxied in place. The lite-ply nose ring is sized for a 2-1/4" dia. spinner and epoxied to the ends of the engine bearers. Shape the wing root contour interface and check by joining

the wing until it fits snugly. The wing root must be cut out for the aileron servo and the rails installed here. Opposite the aileron horns in the fuselage, slots must be cut to accommodate the legs and pushrods. Likewise, an opening up forward must be made for the R/X as the foam blocks are installed. The battery is placed next to the fuel tank and secured prior to gluing in the foam plug. Now it's time to get out the sanding blocks and carefully sand the fuselage to shape using the foam bulkheads as guides.

The floats are made similarly using the foam board as keel patterns right up through the pylon legs. Add lite-ply doublers to the pylons and make allowance for them when cutting out the foam side pieces. Remember to

Material Lists

1 can — water-based Varathane, preferably satin finish	6 feet — 1/4" x 3/4" balsa TE
1 can — gloss oil-based house paint, tinted to A6M2-N green	6 — 1/2A control horns
3 cu. ft. (approx.) — 1 lb. cu./ft. expanded bead Styrofoam. (Blue construction insulation foam would also work well but is twice as heavy)	6 — small nylon clevises
8 feet — 1/8" x 1/4" spruce	2 — 1/2A throttle cable assemblies
1 sq. ft. — 1/8" lite plywood	1/16" — strip aileron assembly (Du-Bro #556)
1 — 24" x 30" sheet of 3/16" foam board	9 — small pinned hinges
2 yds. — 1-1/2 oz. glass cloth	2 — 1/16" threaded rods
2 pcs. — 3/8" x 1/2" x 4" bass wood engine mounts	Misc. — SMS's for engine, servos, and canopy
1/2 yd. — 3 oz. glass cloth (for making the canopy)	1/2 foot — 3/16" dowel
4 feet — 3/4" balsa LE	6" x 6" x 1/8" — aircraft 5-ply plywood
2 feet — 3/8" balsa LE	5-minute epoxy
	Tite-Bond glue
	.25-.32 engine
	4 oz. fuel tank.
	2-1/4" spinner
	4-channel radio (5 channels if bomb drop is required)

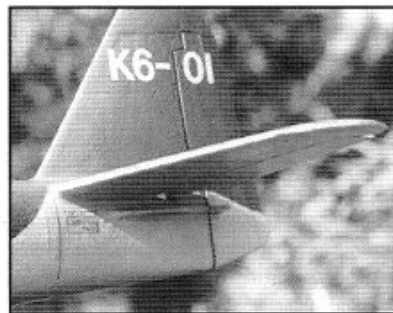
attach the 1/2A throttle cables through the pylon and down the float keels for the water rudders before closing up the floats with the plugs. The floats are contoured similarly to the fuselage. Remember to add the "V" shaped step wedges before covering. Following covering, the floats are inserted in the matching slots in the wings. Then, the lower spar caps and antenna are slipped through the appropriate holes in the pylons and secured with Tite-Bond. Lightweight spackling compound is used throughout to smooth and fill any depressions and holes. During this assembly remember to carefully align the float/pylon assemblies both vertically and horizontally. Standing behind and to the side will aid in this visual alignment!

Tail Group:

These are easy and should come out really light since they only have balsa LE's and TE's for weight. Hot-wire them similarly to the wing, keeping the flashing to hold them in place while sanding the balsa parts to shape. Do not separate the elevator and stabilizer or the fin and rudder until after covering.

Covering:

All surfaces are covered with 1-1/2 oz. glass stuck down with satin



Nylon pushrods used for rudder and elevator control.

water-based Varathane. When using the Varathane, be sure to stir it thoroughly first and before each application. Where compound curves are encountered, short lap pieces may be necessary. Don't worry, with a touch of sanding they will nearly disappear when the final paint is applied. I found three coats of Varathane sealed the surfaces. Note that the ailerons are cut free from the wing, their leading edges beveled, and then taped back in place along with the strip aileron actuating assemblies epoxied in the roots prior to covering. Once covered, the glass is cut from the lower aileron slots, making a continuous top hinge from root to tip. Varathane is then painted in the slot to seal the opening. Working the surfaces up and down a few times frees them up and though slightly stiff, they work well, and not much movement is required.

The tail surfaces are now separated and the exposed trailing edges and rudder and elevator leading edges carefully beveled and glassed. Standard pinned hinges are Tite-Bonded in matching slots. The horns are slipped under the glass into depressions carved in the surfaces near the front and secured in place with epoxy. Screws and backing plates aren't necessary since the epoxy forms a solid mass around the horn bases with plenty of strength for any normal control application. The tail group is not installed until after the wing is permanently seated so that it can be aligned both vertically and horizontally with the wing as reference.

The wing is held in place by 3/16" dowels in the front. In the rear, a single 1/4" x 20 nylon screw is threaded into a companion block imbedded in the keel. The front dowels slip into a 1/8"

aircraft plywood sub-bulkhead which is glued in just behind the slotted #3 foamboard bulkhead. To get the holes aligned, install the sub-bulkhead, lock down the wing, and drill through the bulkhead into the wing LE. Now the dowels can be installed permanently in the wing. A simulated cooling intake was fashioned of foam and glassed. It was not hollowed out, however, just painted black in front.

Canopy:

To get a reasonable canopy I carved a plug out of cedar and drew on all the windows. I then heated and pulled one liter soft drink bottle sections around it until I had pieces of canopy that, when trimmed and assembled, duplicated the plug. Next, I waxed the plug and using 3 oz. glass, applied three layers over the plug. I drew all the windows on the glass shell and cut them out. I then painted the relieved shell and glued the window sections to the inside with Super Z 56. I added four small blocks on the fuselage and attached the trimmed canopy with #2 SMS's. Of course the switch pin was fished through the top first. One window was hinged to allow access to the charge jack which was also run through the top of the fuselage.

Painting:

I matched some RUFÉ sea green up at the big box store, added one third by volume, some flattening paste and started painting. The gray on the underside was some Perfect Paint Sea Gray I had lying around. The key with painting is to be sure it's oil-based. That eliminates most spray cans since the vehicle is too hot to be trusted over the glassed foam. After the pigment has been applied and the hinomarus (meatballs) positioned, a coat of satin Varathane can be applied over the whole ship for fuelproofing. Documentation suggests the operational Seirans were painted dark green; however, the only survivor was the Zero green I chose. Only 28 of these ships were completed. Most were destroyed on orders right after the war abruptly ended. My scale documentation is a Monogram Close-Up #13 book. Those interested can write Monogram Aviation Publications, 625 Edgebrook Dr., Boylston, MA 01505. I think they go for about \$5 including postage.

Flying:

The control surface deflections on low rate are: ailerons, 3/16" up and down; rudder, 1/2" each way on low

rate; and elevator, 5/16" up and down. The C.G. should come out at 25% MAC or 3" from the L.E. with no ballast. Note that the water rudders are actuated with the ailerons. They should be set up to get about 3/8" each side on low rates. In the wind, aileron high rate may be needed for water steering. One only has to remember that water steering is with ailerons, not rudder. Of course, anyone who wants to can imbue a couple of micro-servos in the floats but I found the cost and additional complexity was not warranted.

I found my O.S. .32 tended to overheat when cowed closely so I opened up the area behind the head and beneath the muffler to relieve this tendency. Additionally, since this ship is so light, a .25 would fly it easily. My .32 was certainly an overkill. The 4 oz. tank will fly the ship for 8 minutes easily. A larger tank was not an option due to space constraints. The ship has no bad habits and likes to fly at low power. High power, except for take-off and climb-out, is definitely a rush. Landings are purely conventional and even at high angles of attack the ship shows no stalling tendency.

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