

Largely responsible for the early, prevalent myth of Japanese invincibility at the beginning of WW II, this month's A6M3 Zero concludes the tale of toes.

Jumbo Rubber Scale: A6M3 "Zero-Sen"

By Tom Houle

A rarely modeled variant of the "Zero" series
for Jumbo Scale F/F events. Keep it light!

I selected the A6M3 as the opponent for my *F4U* primarily because it rarely has been modeled as compared to the A6M2 and A6M5. In fact, until I came across *Fighters of World War II* by Charles W. Cain with its excellent four-color, five-views and plenty of text devoted to the "Dash Three," I really didn't have much to go on. William Green's *Famous Fighters of the Second World War* has a black and white photo of the clipped wing version and some supportive text. But as usual, the "Dash Two" and "Five" receive the bulk of attention. As a student of WW II naval air history and a passionate builder of F/F scale models, I really enjoy the research part of each project. I never fail to browse in used bookstores, book sales, and libraries seeking that elusive (and hopefully inexpensive) rare find. Coincidentally, since I finished my A6M, Squadron Publications has released an A6M edition. You might consult this for colors/markings.

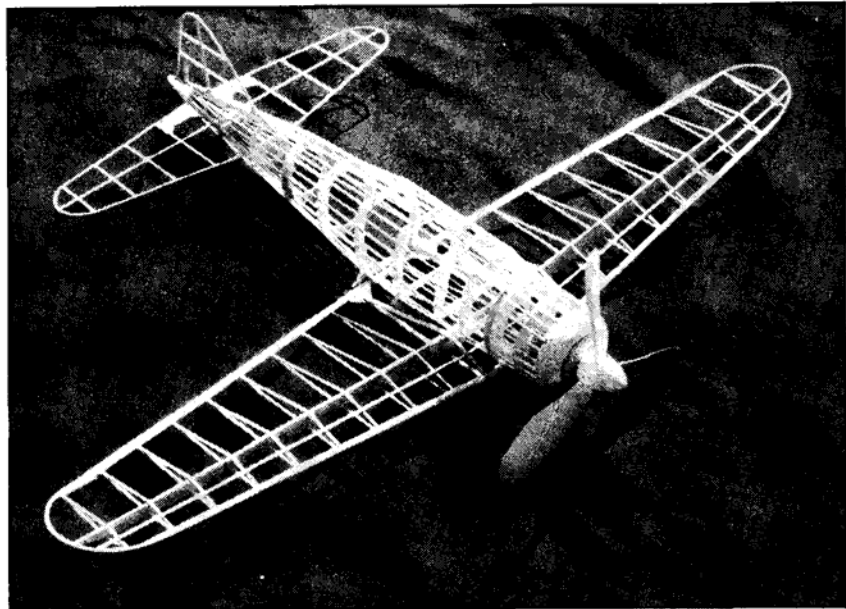
The A6M3 Model 22, a long-wing variant and all other variants were called *Heisen* in Japanese, which translates as *Zero-Sen*; *Zero-Sen*, or *Zero*, because the first deliveries from Mitsubishi were made in the Japanese year 2600 (1940). Early models deployed in China against Chennault's Flying Tigers, followed by the debacle at Pearl Harbor seemed to support the myth of invincibility of both the *Zero* and the Imperial Japanese Navy.

The A6M3 was born six months before Pearl Harbor when Mitsubishi replaced the A6M2 powerplant with a Nakajima 1130 HP Sakae 21 engine. The only difference between the two was that the Sakae 21 had a two-stage rather than a single-stage supercharger. Speed was boosted to 341 MPH at 20,500 feet. Armament was unchanged. Ironically, while combat performance was improved, the larger engine burned more fuel, and because of its large size, required the fuselage fuel tank to be reduced from 26 to 16

gallons. The first combat units to receive the "Dash Three" suggested that climb, speed and maneuvering could be improved by removing the 20 inch folding wing tips. This was done and the squared off "clipped wing" variant was designated as an A6M3 Type O Model 32. It is interesting to note that when U.S. Navy pilots first encountered this square-tipped model they didn't recognize it as a *Zero*. They assumed it was a new design and as such was initially coded "Hap" which quickly became "Hamp" when Hap Arnold found out! When it was later identified as a *Zero* the code name became *Zeko 32*.

Since the shorter range of the Model 32 proved a serious problem for squadrons having to fly 500 miles to the combat zone, Mitsubishi installed two 12 gallon internal wing tanks and refitted the 20 inch folding, rounded wing tips. Five hundred of these were built by Mitsubishi; Nakajima produced an additional unknown number. This variant became the A6M3 Type O Model 22 which is what this article is all about. The Model 22 was selected over the Model 32 for the same reason that Mitsubishi re-installed the wing tips: to get more area. At one inch scale, span differential is over three inches. If you prefer the clipped-wing Model 32, then simply reduce overall span to 36 1/2 inches and square off the tips with 1/2 inch radius corners. My model is colored and marked to represent an aircraft from the First Koku Sentai (First Carrier Division) of the Imperial Japanese Navy aboard the aircraft carrier *Shokaku* in November, 1943. Overall upper surfaces are bluish-green and lower surfaces are light gray. As in all of my WW II rubber-powered models, the landing gear is omitted (legs up). An optional external fuel tank is shown on the plan. While I did not add it, you could easily do so making it removable for flying. The Model 22 flew both with and without this tank so either way is correct.

At one inch scale, the A6M3 wing area is 325 square inches compared to 812 for the *F4U*, but it is also much smaller in overall



Though it has significantly less wing area than last month's Corsair, the Zero's size is much smaller than its larger counterpart allowing the wing loading to stay within an acceptable framework.

size so that wing loading is not out of line. My model, less rubber and nose weight, weighs five ounces (145 grams).

Wing and tail

Let's build an airplane. Starting with the tail feathers, I soaked three $\frac{1}{32} \times \frac{3}{32}$ basswood strips for the horizontal and vertical stabilizer in hot water for 20 minutes. Bending forms were cut from $\frac{3}{32}$ sheet. Using Titebond, I formed, laminated, and pinned the strips around the forms. The trick to smooth bends is to pull the strips while you are forming. These strips must dry for at least three days. I made my wing tip bows at the same time. If you build the clipped-wing variant you won't need these. The horizontal and vertical stabilizers were both built from medium hard $\frac{3}{32}$ squares and copper wire hinged trim tabs. The copper hinges were held in place with a cyanoacrylate glue.

The wing builds up a heck of a lot easier than the *F4U* bent-wing. I cut the main spar from soft $\frac{3}{32}$ sheet and assembled it over the plan with the $\frac{1}{32}$ sheet braces. This spar locks the dihedral; no further measuring was required. At this time I also cut out the $\frac{1}{32}$ and $\frac{1}{8}$ sheet leading edge strips and glued them together. A trailing edge was shaped from $\frac{1}{8} \times \frac{3}{8}$ medium strip. The wing assembles quickly by starting with one of the outboard panels. I pinned the notched main spar to the plan along with the leading and trailing edges. Squares from $\frac{3}{32}$ sheet were cut and fitted for the bottom ribs. These should be fairly hard to offset tissue shrink. The tip bow was added and positioned to fair into the upswept end of the main spar. Then I added the top "cracked" $\frac{3}{32}$ square ribs running them through the appropriate notches in the spar and leading edge.

The completed panel was then removed and I pinned down the spar over the opposite panel and repeated the process. When this was dry, I completed the center section making sure that the main spar was straight tip-to-tip. It is easy to be off by a $\frac{1}{16}$ inch or better. You should now have a completed

wing. I added the $\frac{3}{32}$ square turbulator strip and also rounded and shaped the tip bows and leading edges. The turbulator strip is located mid-way between the leading edge and the main spar.

Fuselage

On to the fuselage; I cut out all bulkheads first. Like the *F4U*, take your time and do neat work. There are quite a few bulkheads, and if you are like me, it's tedious work. The cowl is built in one piece vertically whereas from the firewall back, the fuselage is built in two halves—upper and lower. I built my cowl using heavy $\frac{1}{8}$ square longerons and stringers since noseweight was required. A couple of $\frac{1}{8}$ sheet jigs helped to assemble the cowl

in place and keep it true. The aft cowl bulkhead was pinned flat to the plan, and with bulkhead 2 already attached to the four $\frac{1}{8}$ square longerons, it was pinned and glued. The front $\frac{3}{4}$ inch bulkhead laminated assembly was then installed and jigs positioned to ensure that the centers were held. Then I added the $\frac{1}{8}$ square stringers and cleaned up the whole cowl assembly.

The fuselage is easily built by pinning down the two laminated $\frac{1}{16}$ square strips over the top view. These laminated $\frac{1}{16}$ squares make a nice strong horizontal crutch to which I attached the upper bulkheads. It is a straightforward process with the exception that to relieve bulkhead strain and to prevent distortion, I pre-molded the top $\frac{1}{16} \times \frac{1}{8}$ laminated longeron so that it would hold the correct outline prior to bulkhead attachment. After the top longeron was in, I proceeded to add all of the $\frac{1}{16}$ square stringers. It gets a bit hairy around the 7.7mm machine gun fairings but I felt that these fairings characterize the *A6M* and ought to be included. As it turned out, they were definitely worth the bit of extra work.

The upper shell was removed and the lower bulkheads added. Take care that the lower bulkheads are vertical. The $\frac{1}{16} \times \frac{1}{8}$ bottom longeron was added next. The $\frac{1}{16}$ square stringers, wing saddles, and horizontal stabilizer strips were all put on at this time as well as the finished cowl assembly and the foam tail cone. (Use hollowed out soft balsa if you can't stand foam.)

I carved a canopy mold from a piece of spruce 2×4 . As usual, I had a bit of wood grain showing when I pulled my canopy from .005 butyrate plastic. A professional modeler friend has since advised me that the way to avoid this is to either completely fill the grain to a glass-like finish or leave the first canopy on the mold and then pull a second one over the first. While I haven't tried the latter yet, it sounds like it would work. The front of the canopy will have to be trimmed to fit over and between the gun fairings. Incidentally, on the actual aircraft these gun breeches are exposed to the pilot in the cock-

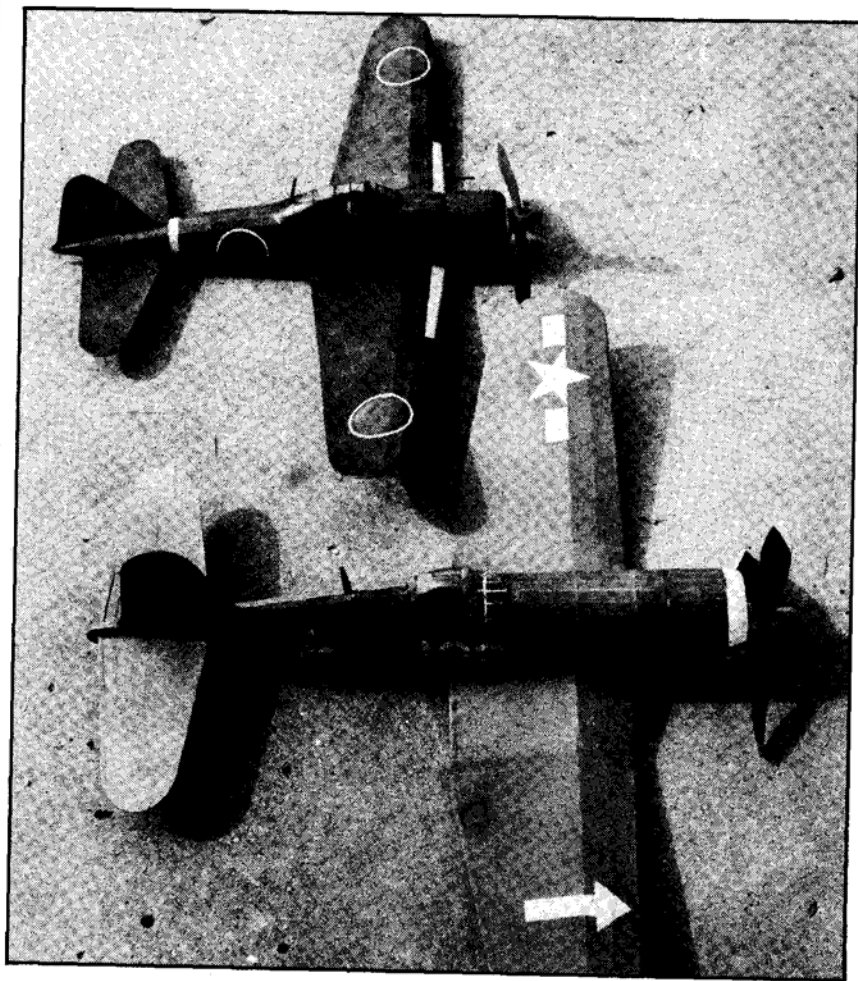
F4U/A6M, Specifications Comparison

Here is how my two 1" scale warbirds compared. The lighter wing loading of the *F4U* made it a little easier to trim. I'm sure with a lighter aft fuselage that the *A6M* wing loading could be reduced to approximate the *F4U*. Keep this in mind when you build yours.

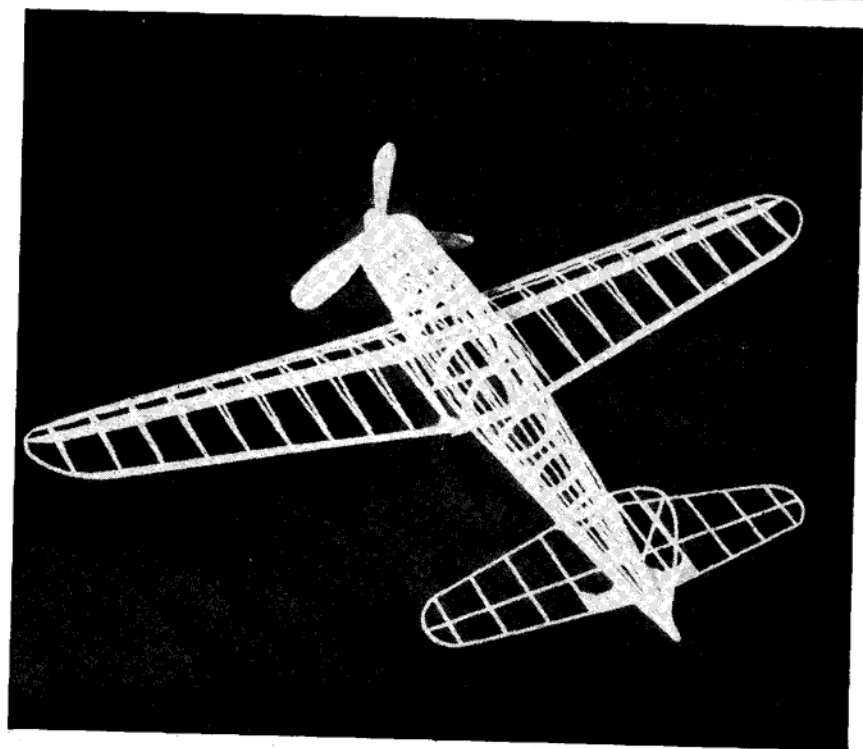
	F4U	A6M3
1) Airframe less rubber/nose ballast	*7 (203)	*5 (145)
2) Airframe with rubber/nose ballast	8.25 (239)	7.4 (215)
3) Rubber	1.4 (41)	1.2 (35)
4) Nose ballast	.85 (25)	1.2 (35)
5) Strands of $\frac{1}{4}$ " rubber (Oldtimer Models)	10	8
6) Motor length	28"	27"
7) Flying loading grams/inch	.72 gms/in.	.95 gms/in.
8) Three-blade prop. diameter (inches)	13	11

*ounces (grams)

This comparison ought to stimulate some of you WW II fighter aficionados to get started on your favorite warbird. There are plenty of excellent jumbo projects like the *P-39*, *P-40*, *F6F*, *SBD*, *P-51*, and yes, even some twin engine types like the *P-61*, *B-26*, and *P-38*. Keep 'em light and they'll fly a mile! Good hunting. As for me, the *SBD* or *TBF* look like excellent projects . . .



The Zero is much less complex to construct than the Corsair with its bent wing (above). However, select wood carefully, especially for the tail, to keep overall weight down. The fuselage uses crutch construction while the tail feathers are bent and laminated to shape (below) using $\frac{3}{32}$ sheet forms.



pit above the instrument panel. I presume this was to allow manual charging of the guns.

Covering and detail

The complete airplane was covered with white tissue from Oldtimer Models. Peck-Polymer has a similar tissue. I shrunk the tissue with a fine water mist and then glued the wings to the fuselage. The horizontal stabilizer slides into place and was glued after it was positioned. I added the $\frac{1}{32}$ sheet bottom wing fillet fairings, and after cutting 47 bond paper fillets, found the correct pattern as shown on the plans. Don't omit these as they really add to the A6M look. I also formed exhaust stacks from bond paper to simulate formed sheet metal. To stiffen this paper I gave it a light coat of Titebond glue. The two 20mm. cannon barrels and pitot static tube were also added at this point. The vertical stabilizer should not be added until after painting because it's a heck of a lot simpler to add the lettering on a flat surface as opposed to doing it in place.

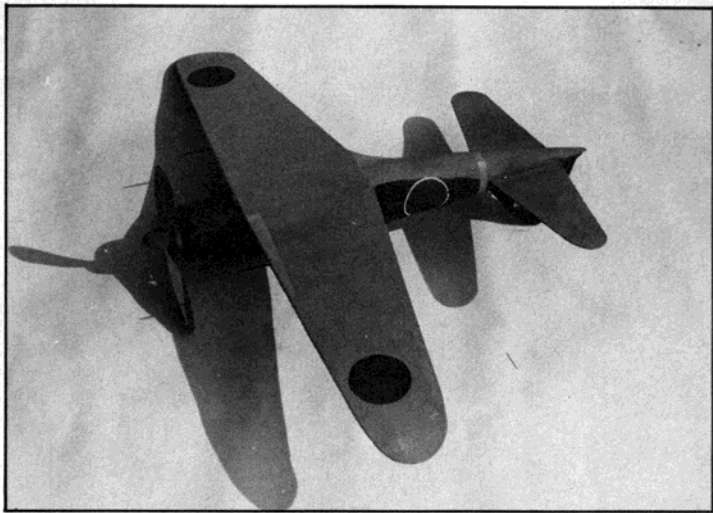
I assembled a three-blade prop assembly from three $5\frac{1}{2} \times 1\frac{1}{2} \times 1$ hard balsa blocks. They were sawn to the outline shown on the plan and then epoxied into the final assembly. With the .045 music wire prop shaft epoxied in place, the blades were carved, starting with the backs of the blades. The spinner was shaped from a solid balsa block. Other than to clear the music wire, there is no need to hollow the spinner. I did not add a free wheeler as I really didn't think it would help performance. But do install one if you prefer. My configuration required an S-hook to enable winding. I made mine from .045 music wire and covered the portion that holds the rubber with tubing. An .045 ball bearing assembly from Oldtimer Models was used. The nose block, with $\frac{3}{32}$ brass tubing, is straightforward and should be self-explanatory. I built in about two degrees of downthrust and no sidethrust. Make sure that the noseplug fits snugly to prevent prop jettison at 100 feet!

Finish

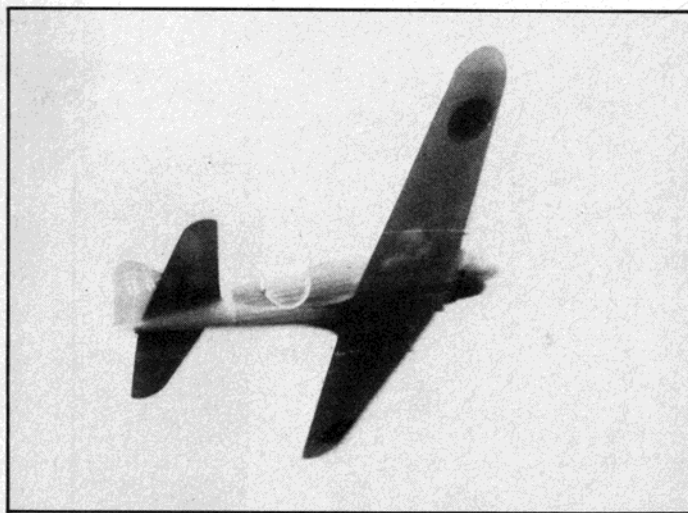
For the overall finish I sprayed Floquill "cement" railroad model paint on the lower surfaces to duplicate the light grey of the prototype. For the upper bluish-green surfaces I selected Aero Gloss Stinson Green as a close match. You might consider trying the Badger Airbrush water soluble opaque paints of which their aqua color is close to the original. I sprayed the Aero Gloss (cut 60% with thinner) directly onto the white tissue. This provided a reasonably light weight finish with the slight sheen of the prototype. The blood-red and white insigniae and lettering were hand painted with acrylic paints and stencils. Do not forget the gold flash on the wing leading edges and the gold band around the aft fuselage. I did these with dope over the bluish-green.

Flight trimming

Since I had already flown the F4U, I had less trepidation when the A6M was ready for flight trials. I prepared a one ounce motor using Oldtimer Models $\frac{1}{4}$ inch rubber which worked out to eight strands, 26 inches long. It was braided to shorten it up. With a few turns in and the prop pinned, the C.G. was checked. My model came out very tail heavy. Quite a bit of clay (in excess of one ounce) was required to ballast the nose. All up, with rubber and ballast in place, the flying weight



Choice of realistic finish for the Zero may lead you to use some non-traditional sources. Bottom grey was Floquil's model railroad Cement color.



Initial powered flights were pretty exciting until a bit of right thrust was added to correct a steep climbing left turn. See text for details.

was 7.2 ounces (209 grams). With 225 square inches of area, this puts wing loading at .93 grams/square inch, which is slightly above the optimum. By comparison, the *F4U* came in at a flying weight wing loading of .77 grams/square inch. In comparing the two models further, I found that whereas the *A6M* weighed in at 87% of the *F4U* flying weight it had only 73% of the wing area. So much for building the clipped wing version! My *A6M* bare (less rubber and ballast) weighs five ounces (145 grams). I suggest that you carefully pick your wood and keep the aft end as light as possible to reduce the amount of nose ballast required. It flies fairly well, but with its higher loading it flies faster than the *F4U*.

I have offset this to some extent by moving the C.G. forward which increases the angle of attack and consequently allows slower flight. The penalty, however, is increased downthrust which reduces available climb power. The solution is obvious: build lighter. With this set-up, a touch of up-elevator tab may be required for glide trim.

I always glide first in tall grass and then go to 100-turn powered flights. My first powered flights were pretty exciting. The *A6M* would climb in a left turn, then power stall, followed by the standard torque roll to the left with a quick, almost vertical descent. Thanks to the tall grass there was no damage done. Downthrust would not stop the power stall until I added right thrust and estab-

lished a right hand power pattern. No matter what I did when it flew left, it would eventually roll in. To the right it will maintain a moderate climbing spiral turn, eventually transitioning to a flat descent with the prop ticking off its last few turns. Initial flights were made with eight strands of Oldtimer Models $\frac{1}{4} \times 21$ inch rubber. This length, however, provided too much torque at launch so I made up a 27 inch motor which was much more manageable for the initial burst. I recommend that you start with 26-27 inches; just be sure to braid it to shorten it to 14-15 inches. This really helps trim. Consider, too, adding aileron trim tabs similar to the fin and stabilizer. They make wash-in/wash-out adjusting a snap. 