



Wankel in a Wildcat

by Nick Zirolì

**An O.S. Wankel
.30 in a Semi-Scale
R/C replica of the Navy's
carrier based Grumman
F4F-3 Wildcat fighter.
Might be fun to drop a
hook for arrested
landings!**

We can thank the Japanese for the development of the Grumman "Wildcat." Their success with the A5M monoplane operating off aircraft carriers opened many eyes. This was at a time when the U.S. Navy and in fact all operational naval fight-

ers were biplanes. The Navy had evaluated experimental monoplanes as early as 1934, but found the biplanes better suited to carrier operation. Late in 1937 the Douglas TBD went into service as our first operational shipboard monoplane, a torpedo bomber. In 1936 Grumman was working on the design of a new biplane fighter to supersede the F3F. This was the F4F and also a biplane. However, when Brewster was awarded a development contract for their new "Buffalo" monoplane, Grumman redesigned the F4F-1 biplane into the F4F-2 monoplane. It first flew in 1937 and performance was in general inferior to the "Buffalo". Brewster received an order for fifty-four planes. In 1939 nine "Buffalos" went aboard the "Saratoga" to become our first shipboard monoplane fighters.

Meanwhile, Grumman made many changes to the F4F-2 which brought it up to the F4F-3 design version shown here. A power increase and larger square tipped wing and tail surfaces were two major modifications that were made. Further successful tests, plus operational problems with the "Buffalo" gave cause for the Navy to award Grumman a contract for seventy-eight F4F-3's. Export models were also sent to France and England.

At the outbreak of WWII, the "Wildcat" was the first line fighter of the Navy. Although its performance generally was not as good as the "Zero", its superior armament, rugged construction and skilled pilots made it a formidable fighting machine. *Wildcats* were produced by Grumman until May 1943, during which time 1,971 were built. General Motors took over production at this time producing 5,276

more, the FM-1 and FM-2 versions. Production ceased in August 1945.

This model is patterned after the plane Lt. Butch O'Hare flew. He received the Medal of Honor for shooting down five twin engine "Betty's" and damaging a sixth in one air battle.

I've always liked the "Wildcat" and think of it as the classic Navy fighter. As an R/C model though I've always passed it over as being a little too bulbous to be practical. I did do a Controlline profile of the aircraft about ten years ago that was published here in "Flying Models", my first article.

What got me going on the "Wildcat" this time was the O.S. Wankel engine. It's unique circular shape lends itself to cowling in a plane with a radial type engine. A friend Carlo Massulo, who built the F4F-3 in the early color scheme, and I went over three views of a lot of planes before it was decided we would build the aircraft. Thus the thought of a small light weight "Wildcat" that would really perform with the Wankel came to be.

I had been flying the Wankel in a larger airplane, just to find out what to expect from it. Having heard so much pro and con about the engine, I felt some flying time would resolve these questions. The only thing I can summarize from the flying I have done with it is that anything that can be said against it might apply to the earliest examples. I found it a delight to operate, with the one exception that the needle valve seems a little overly sensitive.

Hand starting, cold, is easily accomplished if it is primed three times during three revolutions of the prop, once for each revo-



At left: A Grumman F4F "Wildcat." A shipboard fighter craft that turns the clock back. At any angle it was easily recognized. It was more available than great, fought hard for the South Pacific sky, succeeded by F6F. Above: Nick with hands full. He chose wartime colors, Carlo's in squadron paint of the U.S.S. Saratoga. Design performs superbly, for experts.

Below: The circular Wankel is a natural for the tight confines of a ring type cowling. The engine offers .30 displacement, starts easily but just a bit harder if it's really hot. Just about any standard type .29 to .40 powerplant may be used, though a cylinder head may be partially exposed. Steady, reliable power is what you need in a warm-blooded Scale design.

lution. It will easily start with only a few flips of the prop. Hot starts are another story. These are best accomplished with an electric starter, unless it can be allowed to cool for a minute or two. The Wankel runs very hot and boils away a prime before it can be used.

Power is exceptional for a .30. I've been running an 11x4 which turns a little over 12,000 r.p.m. The idle is good and not critical.

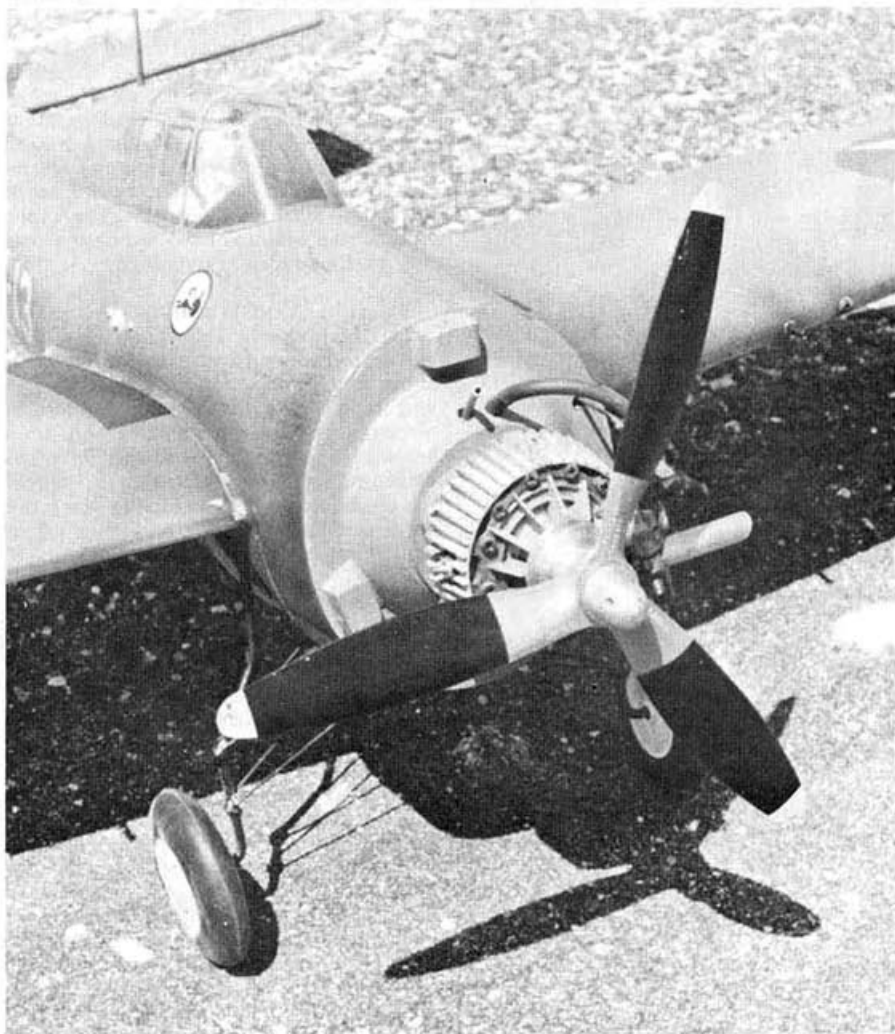
One notable thing about the "Wankel" is the sound. Even without the muffler it is very quiet. With the muffler it can hardly be heard on a final approach. The sound it makes is very distinctive.

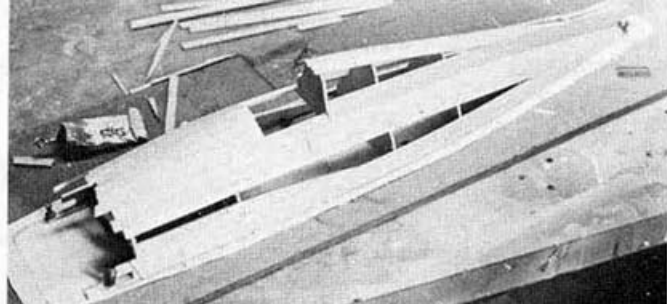
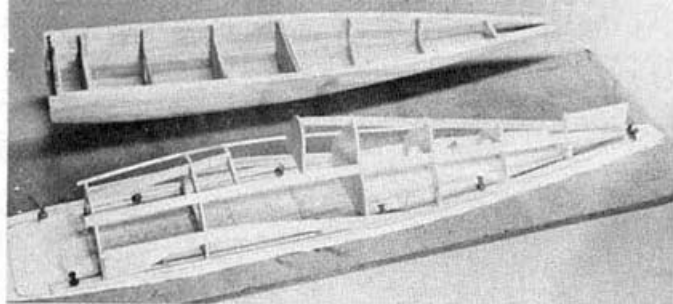
Among the features I find I like about the Wankel is the very low vibration level. It seems that there is little more vibration than an electric motor. It is really smooth! This adds to the life of the R/C system. Vibration is the radio's worst enemy, one of the major causes of failure.

The model is approximately one-tenth size or 1-1/5"=1' scale. The span was increased to 45", and the chord accordingly enlarged. Also, the stabilizer area was increased. The fuselage is as close to scale as could be drawn by measuring off a smaller 3-view. In spite of the enlarged wing it looks right.

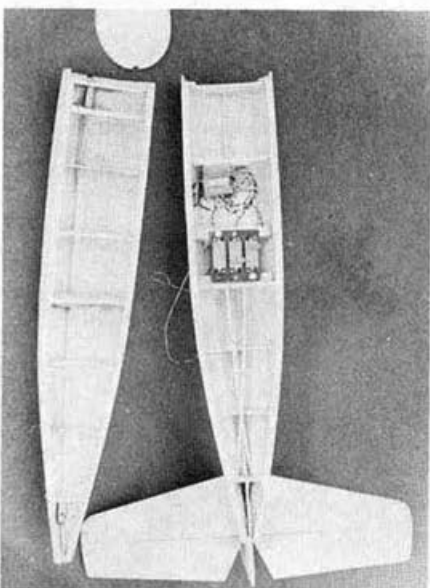
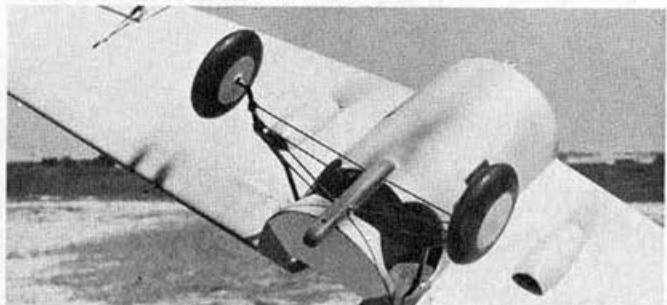
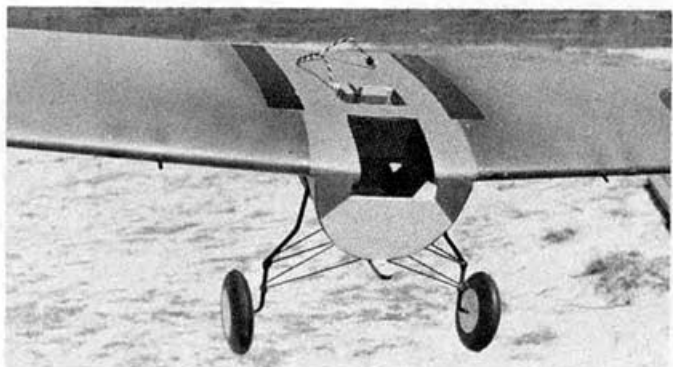
Performance can be described as lively. It is by no means for a beginner or a training plane. It is fast and maneuverable, yet stable at low speeds. This is due to the generous washout in the wings and a well forward center of gravity.

Fuselage construction may seem a bit old-fashioned for 1972, but I have not found a faster way to build a light weight round

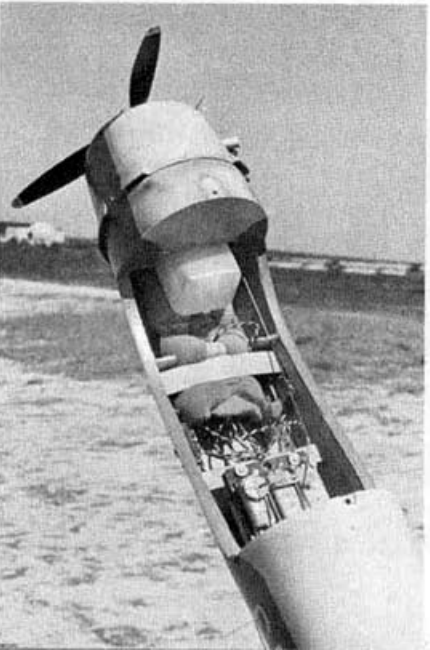




Plank fuselage, easiest solution. Plane edge of one plank to meet other. Top left: A top and bottom section of the fuselage, joined at the crutch. Left: Wing removed, gear and servo installation offers no big problems. Below: Gear is well braced, functions fine.



The beam of the fuselage is more than adequate. Micro Avionics servos installed three abreast. Below: A cowled Wankel powerplant, Pylon tank, battery pack, receiver, servos aft, accessible.



fuselage. With all the planking it may not seem as if it is a fast way to build, but consider the fact that when the planking is completed, only a little sanding is required to bring it to final shape. Also there is a minimum of unsightly sagging between formers as compared to sheet balsa covering.

Space is rather limited inside the fuselage for radio equipment. Even though it is fat, the wing through the middle takes away a lot of room, so a small radio system is necessary. The World Engine's S-5 or Kraft KPS 11 are about as large as can be installed. Check your radio system with the plan to make sure it will fit. The under wing fairing could be used to house a battery pack or receiver if necessary.

Construction

The fuselage is constructed in two halves, top and bottom, over the top view of the plan. Pin down the 1/8"x3/8" outline longerons on the plan. Cement formers in place on the longerons, making sure they are square to the plan. Add the 1/8"x3/8" longerons to the top or bottom. I suggest the top be made first as further work can be done on it while the bottom is being built. Cement the 1/8" sheet doublers in place. Dampen from the outside so they will curve easily and fit against the formers. Cement F-10 stabilizer platform between F-8 and F-9. Start planking as shown on the plan, using 1/8"x3/8" medium soft balsa strips. To insure equally graded strips I cut them out of selected sheets of 1/8" balsa. An X-acto balsa stripper will turn a sheet of wood into perfect strips in a minute and it's cheaper than buying them cut to size. After the first strips are in place, add F-3C and F-4C. Complete the planking by alternating from top to bottom, tapering only the rear end of each plank. Work both sides equally. All planking should overhang F-1 at least 1/4" since the firewall will fit inside it. Epoxy the stabilizer and fin in place while the fuselage is still pinned down. It will be easy to square it all up at this time. Use spackle to fair in the

fin. I have found "Dap" is excellent for the purpose.

When dry, remove from the plan and start the bottom half. Leave a small space between F-2A and F-2B, also F-5 and F-5A. The thickness of a postcard is about right. Epoxy the 3/8"x1/2" hardwood and 1/4" plywood mount blocks in place, then cover with planking. Make a pinhole between the F-2's and F-5's as the planking is applied. This will give a cutting line for removing the wing fairing later.

Install servo mounts and "Gold-N-Rod" pushrods in the top section. Cut out and epoxy elevator and rudder parts together.

Pin the 1/4" sq. wing spars and rib shims to the plan. Cement the ribs, top spar, leading edge, and 3/16" sq. aileron spar in place. Sheet the top of the wing with 1/16" or 3/32" sheet. I use 3/32", which leaves more room for sanding. When dry, remove from the plan and epoxy the landing gear blocks in place. Join the wing panels with the 1/8" plywood joiner. Dihedral should be 1-1/2" under each tip. Install the aileron bellcranks and pushrods. The aileron pushrods themselves are installed after the wing is completed.

Sheet the bottom of the wing, being careful not to build in any unwanted twist. There should be some washout. Mark the location of the aileron horn holes so the pushrods can be inserted later after cutting a slot in the sheeting.

Add the soft block wing tips and sand the wing smooth. Cut out the ailerons. Cover the wing with 1/8" sheet. Cement end ribs and the 1/8" ply horn mount into the ailerons, then sand off the front and cap with 1/8" sheet. Prepare the hinge slots in all surfaces.

At this point make up the tail wheel assembly. After the bottom has been removed from the plan, cut a hole and epoxy the tail wheel in place. A separate pushrod, "Gold-N-Rod" runs from it to the inner hole on the rudder servo arm. Connect it to the tail wheel arm and epoxy the "Gold-N-Rod" outer tube to F-8. Make a hole in F-5 in the top section for it to pass through when the



Fighting maneuverability in the prototype translates into quick response in the model. This airplane can change direction at the flip of a stick.

Son Nicky lines it up into a stiff wind, a first flight. Micro Avionics. Top center: Nick's F4F Wildcat breaks from the ground, in perfect trim.

halves are joined. Epoxy the hardwood rear wing mount block into the bottom section. Cut away a little of the wing opening in the top section, just enough so it can be located after the halves are joined. Cement them together and hold with masking tape. Make sure the F-1's are even with each other.

When this is dry, epoxy the 1/4" firewall in place. If the "Wankel" is going to be used, cut out the center of the firewall as shown. This will allow the fuel tank to extend into the engine mount block. The engine mount block is a 4" dia. disc of 1" thick balsa that is tapered down to 2-1/2" and hollowed. Sand the front of it to obtain a little down and right thrust, before epoxying the 1/8" ply engine mount in place.

A conventional engine can be mounted in a standard mount, Tatone, Kraft, etc. and bolted directly to the firewall.

The cowl may be fabricated from blocks and hollowed, or molded in Hobbyoxy and glass cloth over a carved mold. Details of this method are available from Hobbyoxy. The cowl is held in place by three small screws into hardwood blocks epoxied to the firewall.

Cut the wing fairing section of the fuse-

lage free and fit the wing in place in the top section. Trim the fairing to fit the bottom of the wing and at the same time be even with the rest of the fuselage. Epoxy and bolt the aluminum angle to F-5A. A plywood tab could be used instead of the angle. Set it in flush with the bottom of the wing fairing between F-4 and F-5. Cut the window holes in each side of the fairing. Paint the inside olive drab and cement the windows in from the inside. Set the wing in place on the fuselage and cement the fairing to it.

Cut out the wheel wells and mount the landing gear legs. They protrude from inside the wheel wells.

Profile Publication number 53 gives some color schemes and markings. Carlo's version is taken from this and is very colorful. Use your favorite finishing method, as long as it is light in weight. Paint the inside of cockpit before cementing the canopy in place.

Our models were covered with light Silkspan over a couple of coats of clear that had been applied and sanded. A few more coats of clear (sanding between each) and the cowl was applied.

Contact paper was used for all masking

of insignias and markings. This is much easier and faster than masking tape. The outline is cut out of the contact paper, applied to model and painted in. Do not use any clear dope to seal the edges. It is not necessary and may melt the contact paper.

Install the radio and engine. Add weight to the front of the cowling if required to get the proper balance point.

Flying

Flying the "Wildcat" is no different than any other multi. If your field is rough and bumpy, don't taxi any more than necessary. The narrow tread makes it very difficult on rough ground. Get plenty of ground speed before taking off and maintain good speed when landing. Hold off close to the ground until the speed is down, then land. Low speed performance is good up to a point, but then it will quit flying suddenly. The lighter the model is the better it will perform. Try to hold the weight down to 4-1/4 pounds or so and your "Wildcat" won't get too wild to handle.

It really looks great in the air, as well as on the ground. It's an unusual model, with an unusual engine and with the O.S. Wankel, it flies extremely well.



Side profile reflects its biplane ancestry, the 1930's in aerodynamics. At left: The OS Wankel settles down to a solid run, a good idle and top end. Just the right power to weight. Keep up a moderate approach speed.