'ORCA' F.A.I. Power

By LARRY SICURANZA

ENGINES

There are no less than nine engines to choose from, ranging in price and availability from great to miserable (*The new Cox .15, due to be released at any moment, makes it ten. wcn*). The Rossi has been boss since it appeared and is my first choice (as of the moment) for performance and handling. I quite often hand-start it, and it never acts up. Availability is improving, thank goodness. If you can't go the $75 for a Rossi, look at the Kosmic and the Taipan. Both are less expensive, easier to find, and both are good enough to win. They'll turn over 22 grand stock. A new entry is HGK but I haven't seen one run yet. Engines in the works are the OPS, the new KB, Cox, and the STX. Two mills readily available but not competitive in stock form are the ST and KBS. However, you can send them to Ron Sheldon (the Pylon guy) and have him give them the treatment he gave mine. The KB is now turning near 22, and the ST is over that on the ground. Ron's address, and others, are at the end of this mess.

To make a long story short, there is an engine you can afford and get hold of, that is competitive. And remember that consistency is more important than top revs . . . Every time.

MOUNTS

The engine you settle on will determine the mount you use. There are five to choose from this time. For the Rossi, ST and Taipan, there are pans by Ken Oliver, Guy Shaw and ST. I like the streamlined circular section of the Oliver, but you might like the extra room behind the engine available in the Shaw mount. The ST is similar to the Oliver, but lighter and, in my opinion, more fragile. They all cost within pennies of each other, but the ST is a little harder to find. The other pan mount is by Tatone. It's the cheapest to buy, but often needs work to dress the mounting surfaces and clear the engine. For the Kosmic and KBS engines, the best mount is not a pan, but a machined forging by CB. It's big, heavy and nearly indestructable. I believe it was designed for QM Pylon racing, and provides the solidest mount of all. Also the least expensive. If the CB or Shaw mount are to be used, you'll have to deepen the nose of Orca to match. About an 1/8 inch or so.

TIMERS

The choice of timer is improving, too, with Seelig and Monks foremost for automatic airplanes, and Tatone and KSB for conventional. I've built a couple in according with Bill Hunter's article in MB (March '75) and really like them. Took about fifteen minutes to make a flood-off for my A ship. Cost under $5 to boot. It's pretty much a toss-up between the Seelig and Monks. Both have all necessary functions, both cost over $20, both are mail-order. Pick a color. I use the Seelig, and when I mount it properly and keep it clean, it (they) work fine. I'm going to see how much I can get out of the home-made type, that's for sure.

PROPS

The most attention I've seen paid to props is in RC Pylon and CL, and the least is by the majority of free-flighters, It's astounding! A prop has to be matched to the engine, airplane and launch method. An awful lot of fliers ignore the last, by the way. One who doesn't is Mel Schmidt. He sure seems to win a lot. Might there be a connection, d'you s'pose? Fortunately the rules of the event narrow down the prop requirements. With a given weight and total area, the ships are alike as peas in a pod. The difference in performance then boils down to airfoils, aspect ratios, moment arms, incidence, and stuff like that. All right, peas from different pods, but still peas.

The prop you'll need will be seven inches in diameter to start with, and 3-1/4 to 3-3/4 in pitch. The safest props are the full-strand fiberglass types, like K&W and Bartels. Don't use plastic. Period. Notice I said safest, not best. The ones I use are heavy and not always pitched correctly, and they're hell to balance. The weight has become a problem with the new, and ridiculous, seven second engine run. A front rotary engine can windmill a measurable length of time, and the rear rotors are worse. The cure is to short-change yourself on engine run, which is silly, or use a prop brake, which just reduces reliability of the system. One more gadget to piddle with that will go bonkers at the worst possible moment. I'm gonna try a third alternative (if I can ever get my mitts on the wretched things) and that's good ole wood. Well, not old wood, exactly, but the nice, maple ones made by Rev-Up that I order from every hobby shop in town every other week and haven't seen yet! Interestingly, I use Rev-Ups in all AMA classes, except 1/2A, and have never had to re-pitch one. Since wood is lighter than glass, the fly-wheel effect should be lessened. No matter the type, constant inspection is necessary, and I mean before every start. Both my good engines turn over 24 and I never forget it. Don't forget my earmuffs very often, either.

We're almost to the airplane, but first here's where you can get the good stuff you'll need.

Engines and rework: Ron Sheldon,

Oliver pans and Seelig timers: Doug Galbreath, 707 2nd St., Davis, CA 95616.

Shaw pans: FAI supply, Box 9778, Phoenix, AZ 85068.

Monks timers: Colony Enterprises, 2337 Ewing St., Los Angeles, CA 90039.

K&W props and pitch guage: K&W Enterprises, Box 18895, Phila., Penna, 19119.

Bartels props: Aeromodels, Box 245, Culver City, CA 90230.

If I've missed a related product or source, it's because I didn't know it was there.

Finally, the ORCA. *(Thought you'd never get to it! wcn)*

Orca has been flown in all configurations; conventional, auto-rudder, and automatic. It's safe in all of them, too, but top performance demands the auto set-up. Why? Glad you asked! In conventional form, incidence is fixed at one and one-half to one and three-quarters degree and CG is at 80%. For a good transition, climb turn is necessary, detracting from the altitude it can reach. Down and left thrust are required, further inhibiting climb speed, and the low incidence makes stall recovery dicey at times. Adding auto-rudder reduces the climb turn from 1/2 in seven seconds to 1/4, increasing altitude appreciably. The AR also insures a good transition, but you still have that low incidence! The automatic configuration allows a nearly straight-away climb (I still like to see some right tendency), auto-rudder brings the nose down smartly, and the two-and-a-half degrees of incidence (CG is now at 67%) give a smooth, bouyant glide, with quick recovery from turbulence upsets. Considering the ultra simple single-line V.I.T. system described and shown, I don't see much point in building the conventional version. An automatic Orca will beat it's ears off. You might as well face it now; in any FAI competition, you just aren't going to find any bum birds or fliers to walk over. At the USFFC there are generally 20 to 25 guys entered in Power and I ain't too happy about taking on ANY of them. To rub salt in, I now have BOTH of the Simpson brothers within 100 miles. Oh, well . . . back to the bird.

For those of you fond of numbers and reasons and such trivia, here's Orca's vital statistics. Projected wing area (what holds it up) is 448, and aspect ratio is around 8.4, also projected. Double taper platform is used to give a high aspect ratio while providing a large root section

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for strength. The airfoil is the Neelmeyer, a DGA from MODEL BUILDER. The foil operates at near 1-1/2 degrees in the climb and another degree in glide. Stab is 27% of the projected area and 8% thick. It's a zip-zip airfoil, but I was looking at the Rhode St. Genese 28 while I was zipping. Wing is 1/16 sheet and stab is 1/32, necessary to achieve the 67% CB without ballast. This is the first Orca to weigh less than 28 ounces. It weighs 27, less fuel. Moment arm is moderate at 43% to handle turbulent air, which is what I mostly find to fly in.

Experienced builder or not, if you choose to make this monster, read the rest of this book. Peer at the plans. Ask yourself, "What the hell is this weenie doing?!" And read it again, / know what I'm doing; this whole thing is to explain to you what I'm doing, and maybe help you avoid busting yourself in the foot on your first flight.

So shape up! Mercy!

I always build the stab, fuse and wing, in that order. When you're all through yelling, "so what," I'll tell ya! It's so's I'll finish the miserable thing, that's why. When you build a wing or fuse first you can sometimes put it aside or lose interest or be diverted, and say, "Oh, I'll finish it some other time." But nothing nags me more than to have a stab laying there, leering, humming 'I ain't got nobody', Drives me berzook! So I build a fuse and pin it on to shut it up. Well, when you're that far, you know you'll finish the toad. Who can ignore a four-foot fuselage with a happy tail?

So let's start with the stab. All right, be pugnacious, skip to the wing. I don't care, you'll come back here sooner or later. See you then.

STAB CONSTRUCTION

If you're using the CB or Tatone mount, use hard wood for the whole stab. Otherwise, use 6 to 8 lb. stock. The stab bottom sheeting is trimmed, butt glued with Titebond, and pinned flat. Doesn't have to be over the plans, 'cause you gotta mark the rib and web positions anyway. The leading edge is glued on top of the sheet and the trailing edge is butt glued to the edge. Now install the ribs and webs, one bay at a time. That way you don't need a micrometer eye to get the webs the right length. Let this dry at least over night. You can chop out wing ribs while you're waiting, or chuckle over what you're going to do to your favorite competition enemy, who's usually your best pal. I find this very enjoyable. You wouldn't believe what you can do while crouching over damp glue.

Our scene opens next day to find you unpinning the framework and trimming the leading edge to match the rib contour. The top sheeting butts against the trailing edge and laps over the leading edge. Use water-thinned Titebond to glue and masking tape to hold the works together. Now pin it flat and forget it for a couple or more days. White glues takes forever to dry when enclosed. When it is finally dry, sand the leading edge round, knock the edges off the tips, and epoxy a two-inch length of one-inch wide nylon tape around the leading edge center. That's all at this point.

FUSELAGE CONSTRUCTION

Which includes the fins. Several subassemblies can be made while other parts are drying, which can save some time. The key to this technique is to make up a kit of all the parts involved. Then when you get to the glue slinging stage, you can move like a 1930 movie.

Did you remember to mark a centerline on each former? Select a piece of straight-grained (whatever that is) 1/8 sheet about 2 inches wide and four feet long, and mark a centerline along its length. Mark the former positions and pin it down. It's nice to have a flat bench for this, but you can do with less . . . I do. Using fast epoxy or Hot Stuff, install the formers, matching centerlines. Don't put in the firewall yet. Be sure there is one degree of left thrust cut into the end of the sheet. Now, Titebond the spruce bottom longerons in place.

While this is drying, laminate the pylon, using epoxy, Titebond or Weldwood contest cement. Believe it or not, the tank is next. Modify a Perfect No. 6 tank, or equivalent, per the plans. No leaks, please, unless you have a passion for apoplexy. *Before* soldering in the tubing, make a paper template of the end of the tank, clearly marking the tubing locations. Now laminate the firewalls with epoxy. Is the fuselage dry yet? How about the pylon? Figures. We don't need the pylon yet, but you can shape and sand it if you're in the mood. Now that the bench is covered in wet parts, trace the side onto some straight 1/8 sheet. The left side should be shorter to maintain the left thrust and both sides should show one degree of down thrust.

Is anything dry yet? The firewall is? Peach-keen, drill it to match your motor mount and install the mount to seat the blind-nuts. Now position the tank template on the back of the firewall about 1/4 inch up from the bottom edge. Mark the tubing positions and drill through firewall and mount to clear the fuel and pressure lines. Now see if the tank lines poke through. Glad that chore is done! By now the fuselage sub-assembly should be dry. If your bench really is flat, I'll buy it! Meantime, glue the right side in place. If your bench is like mine, unpin the frame and glue the side in in the air. The straight bottom of the side will align the rest of the assembly. While this is drying, cut and glue the wing table together. Follow by fabricating the fin. Hot Stuff is handy here. Now go back to the fuse and glue in the upper right longeron and then the upper left. Cut and bend the AR and VIT tubing and glue into the appropriate notches. Where they cross, the VIT line goes inside. Sorry you started this heap? That's why we built the stab first!

Now's the time to pin the left side in place so you can locate and cut the tubing exits. When this is done, glue the left side in place. This is followed by the doublers in the nose. Use epoxy here. Now, put in the front and rear stab rests, with epoxy around the tubing and in a fillet around the front rest. Now have a cup of coffee, I've run out of lead.

Next comes the top sheeting and nose doubler. While this dries, glue the trailing edge stock to the bottom of the wing table. When this is dry, epoxy the table to the pylon. It's easier to keep it square at this point. Carefully cut the slot for the pylon and trial fit to check the incidence. The front of the table should be not less than 1/8 higher than the rear, while 5/32 is even better. This is measured from the bottom of the fuselage. With the pylon in place, poke the tank through the firewall and trial fit this assembly to the front of the fuse and the pylon. Trim to get a good fit. Now epoxy everything that isn't already, and head for the nearest bar.

Back to the salt mines. Remove the mount from the firewalls and put a dab of clay in the blind-nuts to keep the glue out. Cut and taper the right check and glue in place. Now for the left cheek, which is not just slapped on. First, locate the timer position on the fuselage side, and cut an opening that the mechanism will just fit through. Locate the timer position on the cheek, and cut an opening that the whole timer will slip through. Glue the cheek in place. You now have a recess with a ledge at each end. Cut two pieces of 3/32 aluminum to fit these ledges. Epoxy in place. Now cut two pieces of 1/16 plywood to the size of aluminum and epoxy them over the metal. We now have nice, solid nutplates for mounting the timer. They're drilled and tapped later. Fill in between the stab rests, and behind, with medium sheet. Cut and glue the end cap for the rear end. At long last, epoxy the fin and subfin in place, carefully aligning both with the pylon. Carve and sand the corners to a radius and fair the front end into the mount. Using epoxy, wrap the nose and firewall with 2 inch wide nylon tape. Set the hateful thing aside, run out and kick the fire hydrant or bite the garden hose . . . Wizz on the petunias?

WING CONSTRUCTION

Wing construction is almost conventional . . . for a sheeted wing, that is. I really like sheet wings for their strength and airfoil fidelity. Build in four, separate panels. Again, use 6 to 8 lb. wood for the sheeting. Note that rib thickness and web thickness and spacing are graduated. Don't deviate. There's enough of them running loose already. The four skins can be cut to shape and butt glued. Don't really need the plans, again, as all members have to be marked.

Pin down a bottom skin, glue in the leading edge doubler and follow up with the leading edge. Look at the plans and pick out the line labeled Rib Ref. Line. Hold the front of a full size rib against this line and cut at the inside of the leading edge. Whack the rear end of the rib off 1/4 inch short of the trailing edge of the skin.

Now mark the proper leading edge height, measuring down from the top. Place a straight-edge from here to the trailing edge (which comes to a point) and lop off the excess with your purple-handled Uber Skiver.

This method keeps the high point of the foil in a straight line. The wing has zero sweep in spite of the taper. When the rib shape is right, cut the notch for the doubler and glue in.

Once all ribs and webs are in, it's time for the built-in warps. Unpin the edge of the panel, shim up the proper amount, and pin down again. The top sheeting will lock the warp in. The top sheeting butts against the inside of the leading edge and stops 1/4 inch short of the bottom trailing edge, a separate cap strip is used to fill the gap.

After drying for a couple of days, trim and sand the edges and ends and we're on the home stretch! Caramba! Epoxy the tip panels, blocked to the correct height, to the mains. Repeat with the mains. Using epoxy, wrap the tip joint in 1-1/2 wide cloth tape, and the center joint in 4 inch wide cloth tape.

COVERING AND FINISHING

We both thought we'd never get here! The wing and stab are covered and trimmed. About 5 coats of thinned dope (any kind) will do nicely. I cover the fuselage (up to the pylon) with silkspan, using 6 or 7 coats of dope. The nose and pylon are painted with thinned Hobbypoxy II. Use dope thinner to cut it. Color scheme should include a dark color for air visibility and a light one for ground. The 1/32 ply scuff plates are epoxied to the wing and stab trailing edges. Bend up and epoxy the stab hooks in place. Locate and drill a 1/8 hole in the stab in line with the tubing in the rear stab seat. Glue 1/32 ply around the rear stab seat to form a well around the tubing. Mount and square up the wing and add split dowel keys. The stab doesn't need keys.

HARDWARE

Now for the tricks! The flood-off release is clearly shown in the photos. Or buy one from Crockett, they're neat. Mount the pan, engine and flood-off device. Cut the exhaust deflector from .010 brass and install. Mark the timer holes, drill and tap 2/56 and mount the timer. Now for the auto-rudder. Thought I'd forgotten, din'cha? You're right, but no harm done. Cha-cha to the end of the fuselage with the fin on it and whack a rudder out of the trailing edge. Use a sharp whacker. Recess the fuse at the base of the rudder about 1/16 inch. Epoxy a piece of 1/16 plywood into the recess for the adjustment bracket seat. Bend, drill and tap the soft aluminum 'U'-bracket, and screw and epoxy in place. Cut 3/32 off the bottom of the rudder to clear this fitting. Now epoxy the aluminum tubes in place on the rudder and fin. Epoxy thin brass or glassboard plates to both sides of the rudder where the adjusting screws will ride. To mount the rudder, cut a small slot in the fin along the hingeline. Slip the wire hinge post through all three tubes, tuck it into the slot, and fill with epoxy. Bend a small hook and epoxy it to the right side of the fin at the base and well forward. This is for the AR tensioner rubber band. Cut the ply rudder horn and trial fit. Trim to avoid interference with the bracket, and epoxy in place, with a fillet all around. Run braided nylon trolling line through the AR tubing, and tie to the horn. Run 2/56 nylon screws into the bracket and adjust for neutral rudder with tension on the line. Slip a ring over the AR release wire of the timer and tie the other end of the line to it. Adjust the right screw for about 3/32 travel with the tensioner band installed.

Stop making noises like an engine, and let's finish this flaming fliegle!

Procure (how's that for class?) or otherwise obtain a piece of hard aluminum, about 3/8 by 1-1/2 by .030 thick. Mark a line the length of the piece about 1/8 from what will be the bottom. Drill a hole, about .040, on the right end of the line 3/32 in. Drill two more holes about 3/16 apart another 1/4 inch in. Look at the photos again. Now drill out the metal between these holes and file the jagged gap into a smooth slot. Mark a second line 5/32 above the existing one. Mark a spot on this line 17/32 to the left of the left end of the slot. Drill a hole here. Cut both release arms of the timer, the VIT arm to 3/16 and the DT release to 1/4. Slip the piece over both these arms and check to see where the VIT arm lays. Elongate the DT hole along its centerline until the VIT arm is hard against the front of its slot. Carefully elongate the DT hole forward of the pin 1/8. This is the glide incidence setting. When the VIT lever releases, the piece rides back against the DT pin, allowing the stab trailing edge to rise. The VIT pin should slip completely through its slot. Be sure it does. At DT time, the piece is released and acts as the DT limit. One line. No hammers. No screws. Now trim away all excess metal, leaving a smooth curve like a very flat S. *(Would you mind going over that paragiraffe again? wcn)*

Bend up the stab retainer from .040 wire, squashing the loop a little. Use 1/2-A control line lead-out cable for the VIT/DT line. Loop an end through the stab retainer, wrap and solder. Keep this joint small, to avoid interference. Run the cable through the fuselage and strap the stab on snugly, retainer in place. Slip the VIT fitting on the timer with both levers engaged. Run the free end of the cable through the hole in the fitting, pull tight, wrap and solder. Strap the stab on as for flight and check the operation of the whole system several times. For a starting point, set the AR to trip a blink after flood-off, and VIT about 1 second after AR. Run through several times. The first mistake will cost you the ship. Depend on it.

PREFLIGHT

A little time here will be well spent. Now's when we look for little things like missing needle valves, warps, holes and such-like. And find 'em! From the nose; a balanced pitched prop, snugged down, no cracks or discolorations. Engine bedded down, fuel and pressure lines installed and unkinked, flood-off release free, wing keyed, timer operation including the timed DT. Stab snug and square, auto-rudder position and a dab of silicone or rubber cement on the screws. And we're ready to fly! You believe that? Gotcha! We didn't check CG position. Should be 5-1/4 to 5-3/8 from the leading edge at the root.

Wrap a Baggie around the engine and off to the tall grass. Hand glide, with stab and rudder in glide position, looking for a trace of right turn and no outright stall or dive. At this point we want enough of a glide so the thing won't crash before it can DT. Run up the engine and check all timer functions. While you're at it, set the needle valve for about 18 grand and be sure the flood-off really shuts it down. Rossis' and Tigres' will idle along quite happily at times if the flood is insufficient. It's embarassing, if not fatal.

Set the timer for 3 seconds engine and 30 to 40 seconds DT and light off the engine. Launch at 45 degrees into, a bit right of, the wind. At this power setting, Orca will move at a good clip in pretty much a straight line. She may lean a little to either side after 2 seconds. So far, so good. Don't expect much of a transition, but watch the glide. Trim by adding weight to the ap-

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propriate end, leaving incidence alone. Use the same timer run and wind the engine up a little tighter, 19 to 20. There'll be a noticeable difference in climb speed and this time we'll correct any left turn tendency with a touch of right rudder. If all's well, keep the engine setting and increase the run. Once past 4 seconds, the transition should shape up. At full power and 7 seconds, it may be necessary to delay AR to prevent an actual dive. Likewise the VIT to prevent zooming. With low incidence, a straight-away climb is impressive, but makes me nervous. I like to see some right, just to know it won't go left in a gust. Trim the glide turn for about 45 seconds using the rudder and, if necessary, stab tilt. Treat Orca with respect, she's got teeth! Fly safely and fly free.

● Swift and graceful, Orca moves with effortless power through its three-dimensional realm. Whether rocketing up in pursuit or drifting under the sun, its black and white beauty dominates the eye with sheer majesty.

The above describes the real animal, which I first saw at Marineworld. I was so impressed by this marvelous creature that no other name would do for my new FAI ship. It was already black and white for air and ground visibility and had a pylon shape similar to Orca's dorsal fin.

Unlike the real Orca, known to those who know nothing about him as the Killer Whale, the balsa bird has evolved through only six Marks in three years. This article describes the current version and ignores the others, as everything learned from them is used in Mk 6.

If you've read this far, it's because the photos attracted you, or you're already a FAInatic, or you are thinking about maybe trying FAI Power. If the latter is the case, the only advice I can give you is *do it*! Try FAI. I got into it three years ago after reading the Zingo article in FM. I only wish it had appeared ten years ago! Up 'til then I'd thought that Power was too expensive, too difficult, too this or too that. Fish feathers! It's nothing of the kind. One thing it is, is demanding. None of the instant success or gratification so eagerly sought in our hollow society. You don't buy the pieces, assemble it and win your first contest. The planes are *not* easy to build . . . half-baked methods will not do the job. So if you aren't ready to earn the rewards with care and attention to detail, maybe FAI is too-too for you. Of course, any event can be equally demanding, if you intend to win.

This is exactly the point of this semi-sermon. If you are, or want to be, successful in AMA events, you can shut 'em down in FAI too! ●