1/72 ALFA Turnkey Build, Part-3

A Report to the Cabal:

In all my years of building GRP hull kits of ships and submarine I have yet to work one where there were not significant miss-alignment issues between the hull halves -- in each and every case I was able to overcome this problem through a number of fixes: sometimes I would cut portions of the hull, reposition the parts, and patch the part back together with internal fiberglass tape and resin. On other occasions, I would stress the parts with clamps, rubber bands and tape to the desired shape and then lay in an internal layer of glass cloth and laminate that with resin -- when cured the part would then retain the desired shape. And, as in this example, I simply devise an auxiliary indexing clamp system to force the edges of the two hull halves together when matted.

Most GRP hull kits provide an indexing lip on one of the hull halves. Now if the other hull half is a bit tighter in diameter than the half with the indexing lip, fine -- you get a well registered fit between the two. However, as was the case with this ALFA kit, if the un-indexed hull half bows out to a diameter a bit greater than that of the indexed hull, you get a significant lateral gap when the two are joined.

I've invented, and have used for the past ten years, what I call a 'capture' lip. These are carbon reinforced, cast resin pieces that mount within the un-indexed hull and work to capture the inboard face of the other hulls indexing lip, holding the two hull halves so that the un-indexed hull is forced to mate up to the outboard face of the indexed hulls lip.

Did any of the above make sense? Screw it ... look at the pretty pictures below, maybe that will explain better.

And I finished punching the square holes into the hull -- my client had started this operation, but lost heart halfway through this chore when he realized that he as yet does not have the eye, or tool savvy to do the job right ... most of the hole work here was repairing his mistakes.

And note that I have not yet mounted the stern stabilizers on - I don't want them getting banged around as I rotate and handle the hull during the square hole cutting operations. Also, there is a lot of deepening of existing scribe work on the hull to do, no need to mount those stabilizers till all the grunt work is done.

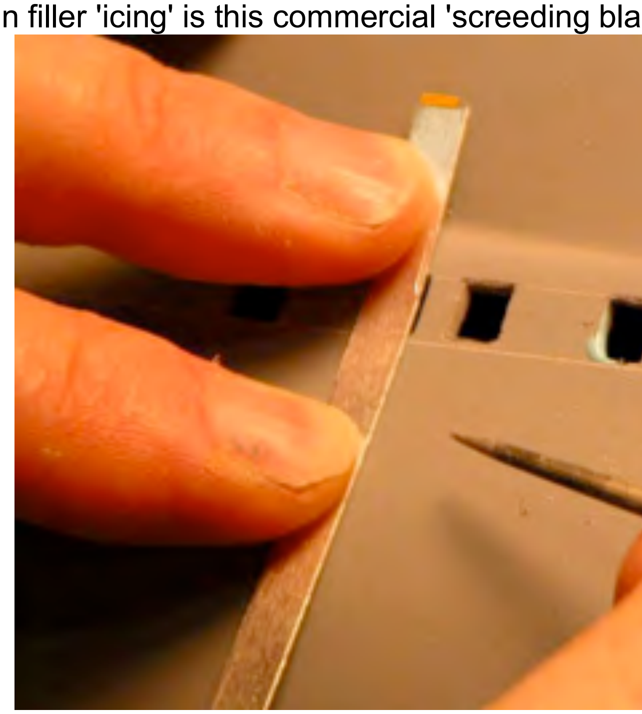
So, We'll install the capture-lips, fill up any remaining lateral gaps in the hull union, punch the many square holes that puncture this Russian hull, and will do some cleanup work on the stabilizers, control surfaces and the other resin appendages.

The upper hull did not seat flush onto the lower hull indexing lip. I used some of my 'capture-lips' within the upper hull, to pull it inwards, tight against the lower hull. Here you can clearly see the soon to be installed capture-lips atop the ill-fitting hull halves -- note the rather obvious lateral gap between them.

Mounting the 'capture lips' internally so that they would grab and hold the inside face of the lower hull indexing lip up tight against the upper hull. These insure that no matter the stress applied to the hull, the two halves will remain in perfect alignment to one another. The capture lips were secured with thin formula CA adhesive after first rubbing baking soda into the weave of the fiberglass substrate. A capture-lip was held in place, a bead of CA was then run around the piece, saturating it and the

baking soda, the baking soda chemically reacting with the CA to immediately cure it hard.
Note the two half-circle GRP transverse bulkheads epoxied within the bows of the upper and lower hull halves.

With the forward transverse GRP bulkhead pieces bonded in the bows and
the capture-lips installed, now came the time to identify the low spots on the longitudinal and radial separation lines and to fill them with Evercoat 'icing' (a thin version of their standard polyester filler). Here you see a freshly applied layer of this filler on the hull. Once it cures out a bit I'll attack it with sanding blocks to redefine the contour of the hull where the two hull halves meet. Best tools I've found when applying the thin filler 'icing' is this commercial 'screeding blade' or a common credit card.



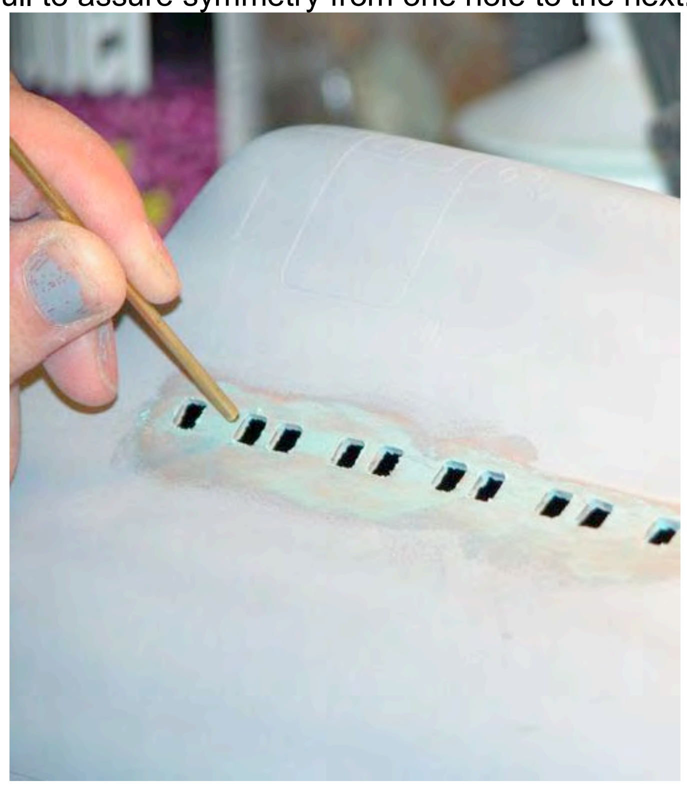
A thin gauge aluminum straightedge, equipped with strips of sandpaper on one face, is used to guide

the scribing tool (scratch-awl) that engraves the guidelines onto the surface of the hull. The guide lines insure near perfect registration of the holes to one another. The engraved outlines of the holes as provided on the hull are a bit uneven in areas.
I got the kit after the client had already taken a stab at punching out the square holes. Man! Talk about 'amateur night'! Some of the holes were all over the place. Note that I've already applied Evercoat putty to fill in sides of some holes that went way over the engraved outlines.

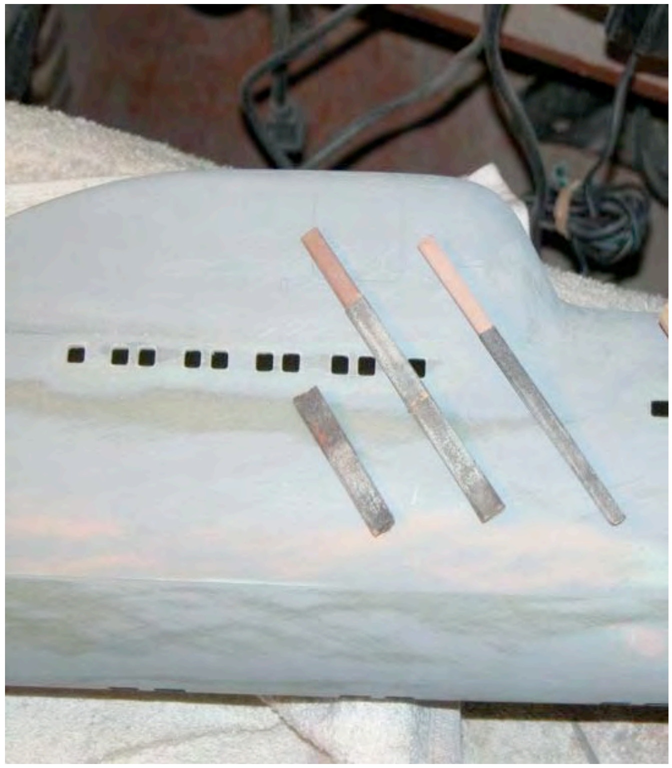
A selection of square hand-files used to rough out the many square holes that infest the ALFA hull.

An eighth-inch diameter carbide burr cutter is used to both punch holes and do the rough shaping of the larger square holes on the ALFA hull. Small drill bits are used in this capacity for the smaller square holes.

Using a square file to give shape to the square limber holes just beneath the sail. Note the cheat marks scratched into the hull to assure symmetry from one hole to the next.



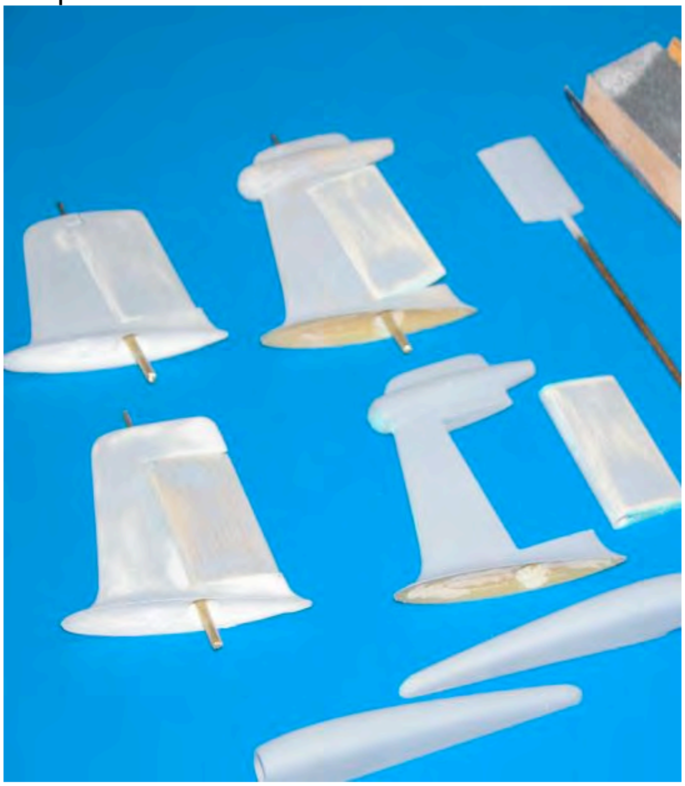
Filler is mixed up, pushed into the holes, then a rod is place in each hole and run around to form the tight radius fillets in the four corners of each hole. This is followed by a surface sanding with a block and a final sanding with the tapered sanding sticks. The filler also acts to fill the engraved guidelines previously etched into the surface of the hull.



A close-up of the special sanding sticks I made to work the 1/72 ALFA kit. I rounded off the edge at each corner of the sticks (before gluing on the sandpaper) to insure I maintained the radius fillet within each hole worked by these tools.

A look at some of the special tools used to accurately grind out square holes that infest this Russian attack submarine. Lower left are two sizes of 'square' files, then some square tapered blocks with #240 sandpaper glued around them -- these are used to establish the final shape to each hole.
The initial hole is started with a Moto-Tool swinging a carbide cutter bit, and the square shape opened

up close to the engraved outline. I then use the square hand-file to take the hole to the engraved outline, I then coat the surface with filler and ran a rod around the inside of the hole to create the slight radius corners of the hole. After the filler cures I use a sanding block to knock down the filler of the surface of the hull (filling the engraved cheat marks) and then use the sandpaper wound tapered square sanding sticks to true up the holes.



Concurrent, but still off-model, went the work to get the appendages up to speed. This involved spot putty filling of pinholes and the like. Each control surface was mounted within its stabilizer and checked for proper fit and unbinding operation. On this model the client, wanted the bow planes to operate, so you see them to the extreme right, next to some of the files and sanding tools I used to dress up these parts.

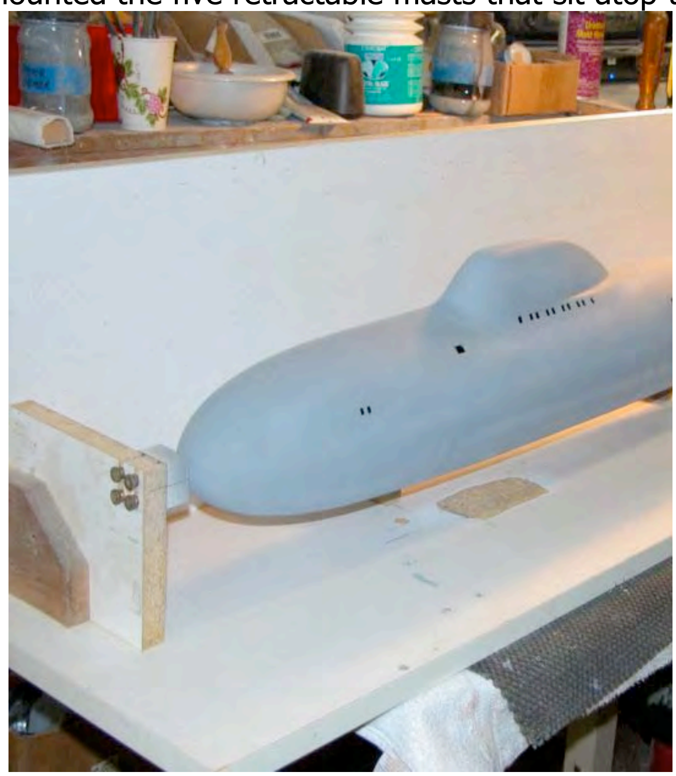
1/72 ALFA turnkey build, part-4

A Report to the Cabal:

Remember, this kit was initiated in the mid 1990s. But, I will point out that because of the severe lack of hard information on the look and details of these Soviet submarines, the kit producer, Greg Sharpe (who, in my book is one of the top three r/c submarine builders on this planet), produced engraving work that bears little resemblance to the actual location and shape of the many limber holes, line lockers, bollard pins, and other features we now know about on the real boats. However, since this is a quickie turnkey job and my client wouldn't know a real ALFA from a BELUGA, it was good enough to simply enhance the form and depth of the existing engravings and to add a few cut lines here and there, just to say I gave it the old College Try.

(It would be totally unfair at this juncture not to credit Wayne Frey with the unearthing of photographs and plans of the actual ALFA boats. I can think of no finer source of information relating to Soviet era submarines than, Wayne. Any future kits of the ALFA will, if I have any say in the matter, will be based on Wayne's researches!). and cutting of new engraved lines.

Then I'll show you how I mounted the five retractable masts that sit atop the hull.



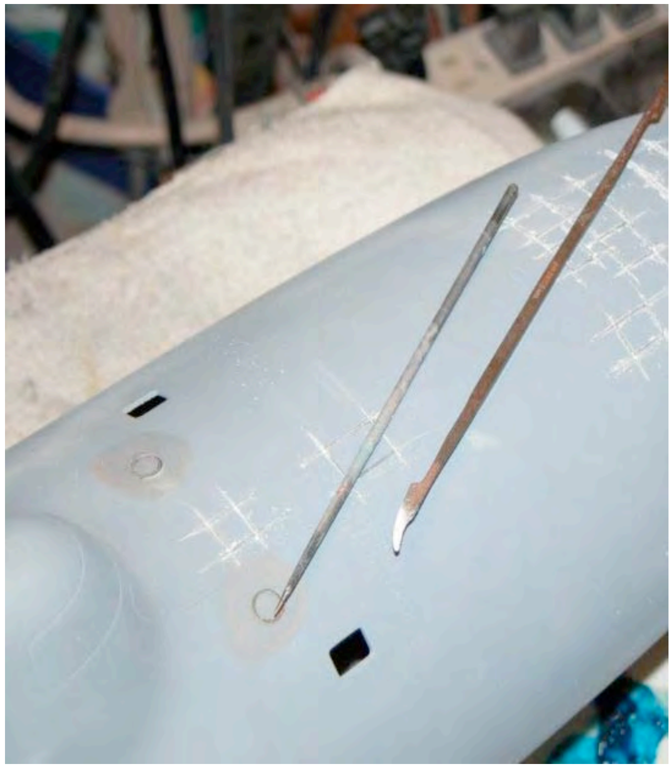
submarines. The purpose of this thing is to mount the model so its longitudinal axis falls along the forward and after pins of the fixture, which fit a fixed height and depth in relation to the fixtures two broad faces. From these faces I can mount right angle blocks, blades, surface gauges, waterline marking tools, or other measuring, marking, and cutting tools -- all used to indicate or cut into the model both longitudinal and radial marks or cuts.

In this case I'm using the holding/measuring/marking/scribing fixture to both scribe the hulls surface and to achieve symmetry and plumb as I test fit, then attached, the four stabilizers at the stern.

I made use of the models preexisting three-sixteenth-of-an-inch diameter hole at the stern for the after pin mount, and cut a one-sixteenth-of-an inch hole in the bow for the holding fixtures foreword pin. A simple foam block, jammed underneath the model, keeps it from rotating once I have the model rolled to where I want it for a marking or cutting operation.

Here I’m using the waterline marking tool with the base clevis loose to permit the arm to swing inboard and outboard -- to mark off the radial line at the stern, needed to identify the point where the rudder and stern plane operating shafts penetrate the hull. You can make out two of the longitudinal lines laid down with this tool to establish the quadrants denoting where the stabilizers will later mount.

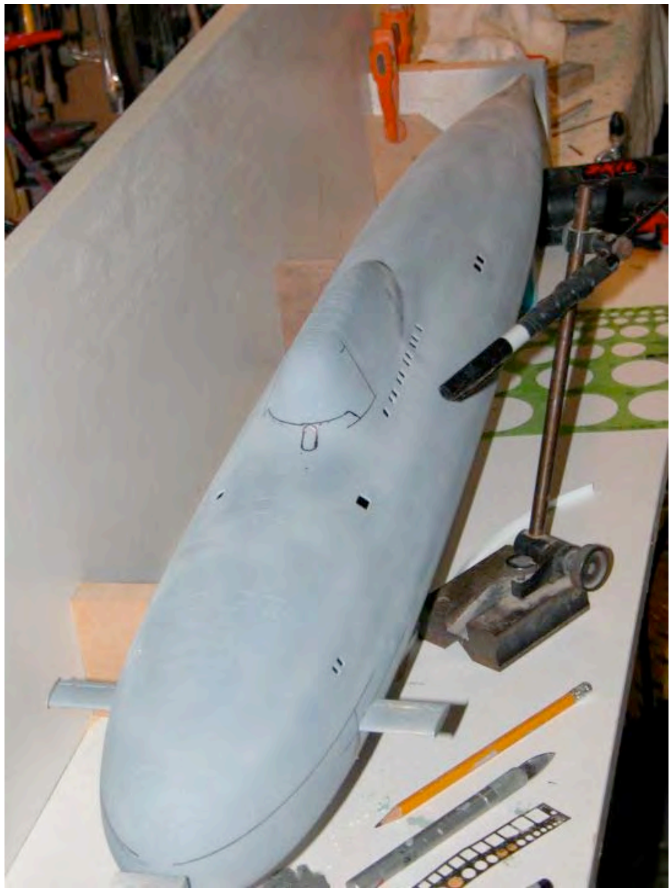
I'm supposed to be the Master of scribing and deck detailing (well, at least until that damn Canadian, Kevin McLeod, showed up ... damn, him!), so I make every effort to either make or purchase the tools and fixtures needed to insure that the work goes down straight and in the correct orientation to the subject’s longitudinal axis.



The pre-existing scribed outline of the various line lockers and other items on the deck were shallow and needed to be deepened. I used a 'V' shaped rifler file to follow the lines and deepen them. I was not worried about overstrikes of the lines, as these would be filled later as I tightened up the width of the engraved lines. The objective of this first operation was to deepen, not make pretty, the preexisting engraved lines. The scribing tool itself -- a modified Jeweler's rattail file, its point sharpened on the mini-grinder -- is to the left and was used to follow the work done with the 'V' shaped rifler file. Circle engraved lines were deepened with a length of K&S brass tube of suitable diameter who's end had been beveled to a cutting edge, then serrated with a knife to make it a 'circular saw,' that tool used with a twisting motion.

Note that the after portion of the deck scribing has been over-coated with filler and quickly chased out with the scribing tool -- this is how the overstrikes are filled and the broad width of the lines tightened up. The forward portion of the hull is about ready to receive its coat of filler.
Scribing is an acquired talent -- you're not born with it. The trick is to practice and to employ tools you would expect (the scratch-awl and straightedge), and tools you would not at first suspect would be of any utility -- sometimes you are pleasantly surprised to find something that works where other measures failed. Would you be surprised to know that a razor saw is the perfect tool for freehand cutting radial lines around a round or ovoid hull? Experiment! Learn by doing!

part filler and chased out, I then used an air-drying lacquer based touch-putty putty to overcoat all re-scribed area and again quickly chased out only those engraved lines I wished to remain on the model. Once the putty had dried (it goes down so thin that within fifteen-minutes it was dry enough to work), I wet sanded all engraved areas of the model with a soft sanding block outfitted with an old piece of #240 sandpaper. Though not the stuff pictured here, my favorite touchup putty is marketed through Mattos, Inc. The stuff is 'Nitro-Stan,' in the big yellow tube. It's worth shopping for, boys and girls!

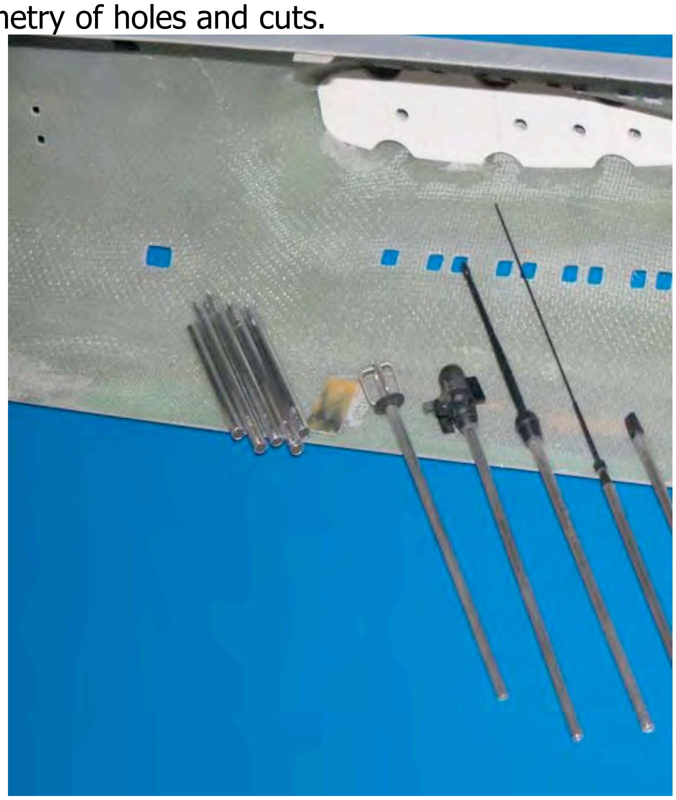


After deepening the existing scribing I set about the task of marking where new engraved lines would be cut into the model. Here you can see I've already laid-out the big sonar window at the bow and the two windows at the front and back of the sail -- this done with a Sharpie pen mounted in a waterline marking tool (modified machinist's surface gauge). While on the holding fixture I plotted the location of the bow plane operating shaft holes on either side of the hull, punched them out with a drill, and here you see the planes test fitted ... they look kinda neat with their tip plates and (non-operational) articulated trailing edges.

Another look at the work as I mark off the new engraved lines with the Waterline Marking tool. Note the various plastic and metal circle templates and cutting and marking tools laying around.

From the kit's fitting package, I pulled out the cast resin escape buoy and its well. A hole was cut into the ALFA's deck, just behind the sail, to receive the well, which was bonded in place with some CA adhesive, the seam between well and hull was filled with Evercoat 'icing,' then wet sanded so the lip of the well sat perfectly flush with the deck. The buoy is a perfect fit within the well. Atop the buoy fits a cast white metal 'marker light.'

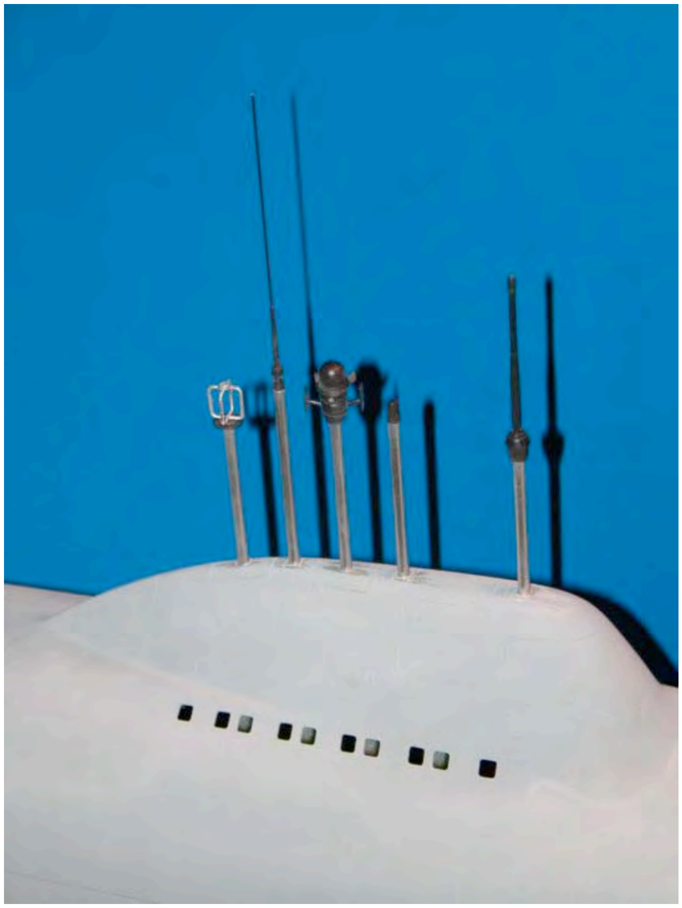
As you can see there are outlines for the two clamshell door fairing that cover the big DF loop and ESC/Radar antenna masts, but I elected not to open these up -- simply to poke holes through the center of each, through which mast foundation tubes would be glued. An internal platform, cut from PVA sheet, had been bonded within the sail to form the second attachment point for each mast foundation tube. Here I'm punching the foundation tube holes through both the top of the sail and the platform within, using the drill press -- wherever possible use your mounted machine tools, this insures accuracy and symmetry of holes and cuts.



(through the top of the sail and through the platform) to accept the foundation tubes. The foundation tubes are simply lengths of K&S aluminum tubing sized to permit insertion of the masts. Each foundation tube was installed and secured to the top of the sail and the internal platform with CA adhesive. A slight crimp at the lower end of each foundation tube would insure that its mast would not slip mast its lower end.

Question: 'Where is the most dangerous place to stand in the world?'. Answer: 'Between Rose and a camera!'.

I've installed the masts from my personal ALFA, that's why the ones you see here are painted black. I'll make the customer’s set when I find the time.



Another look at the five scope and antenna masts projecting over the top of the sail. As these are subject to damage and/or loss during operations I'll make an extra set of masts for the client. Even though Fred is more conservative driver than I am, he will eventually prang one or more of the ALFA masts against the bottom of some unsuspecting surface craft ... ah, er ... target!

1/72 ALFA Turnkey Build, Part-5

METHODOLOGY Notice that I've deferred the job of joining the four big stabilizers at the stern till almost all other structural work had been completed on the project. There's a reason for this: The experienced Model Builder eventually learns to establish a rational order of operations; to perform fabrication and assembly tasks sequentially, in a way that permits a trouble-free integration of components. The goal is to pace things so as to prevent one operation from interfering with another. A planning, the establishment of an order-of-assembly. Methodology.

Even in well documented kits which contain a step-by-step direction of operations, it is a good practice to study those instructions, to consider them only as a recommendation, and to work out your own, more rational, methodology. And that's what I did with this 1/72 ALFA kit: Before doing anything, I sat down and jotted down on a notepad the methodology I would employ on the project. It went something like this:

1 Parts cleanup (removing mold release from GRP and resin pieces, removal of flash from all cast metal parts.
2 Open up all holes in hull.
3 Scribing
4 Hull assembly.
5 Subassembly work.
6 Mast foundations.
7 Bow plane linkage
8 Install modified condenser scoops.
9 Attach stabilizers.
10 Stern control surface linkages.
11 WTC fabrication, equipment installation and check-out.
12 WTC integration with hull.
13 Trimming trials.
14 Painting and weathering.

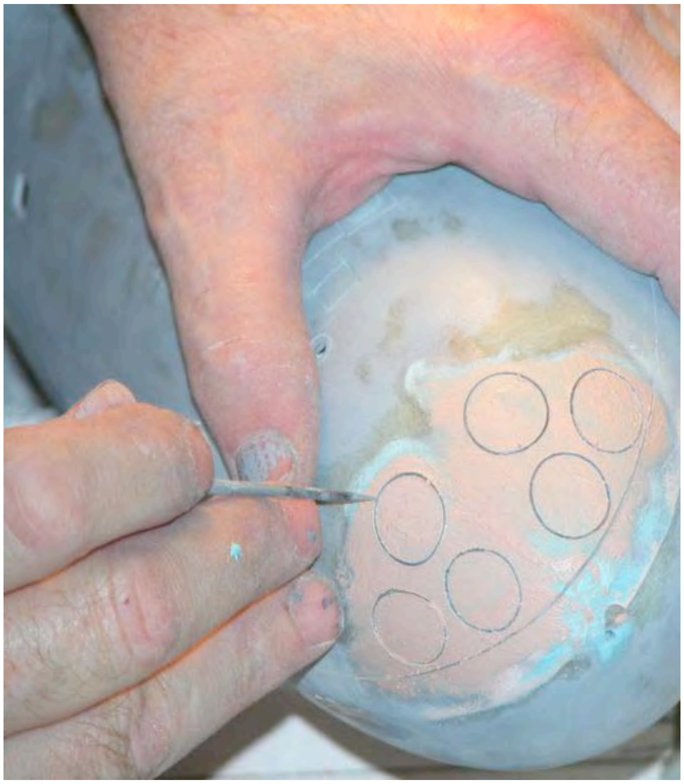
DOCUMENTATION This kit buildup (must be my forth 1/72 ALFA turnkey job!) profited greatly from some recently uncovered information on the prototypes provided by Wayne Frey. This guy speaks Russian, has traveled to Russia, has befriended Russian's involved in the past and current Russian submarine programs and he's gathered an astounding collection of photos and plans that deal with ... wait for it ... modern Russian submarines.

There are too many variants between what this kit represents and what the real things are to warrant incorporation of all the changes needed to make the model truly faithful. However, there were relatively simple changes I could make to produce a better display piece. For example, Wayne's information permitted me to do a better job scribing the hull and to better shape the two condenser scoops that fit under the stern of the hull.

There are some real killer photos of a decommissioned ALFA in dry-dock Wayne sent me, and those will later be used as reference as I paint and apply weathering to this model. Stay tuned --

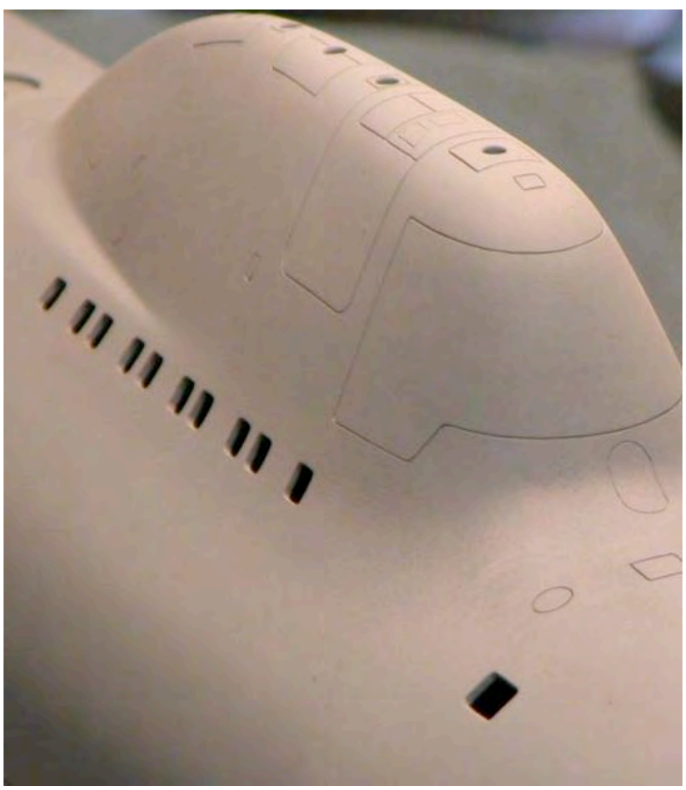
things will be getting interesting soon.

OK, lets look at the most recent work on this turnkey job:



The molds used to produce the 1/72 ALFA kits are suffering a bit of damage over time. This recently produced hull kit evidenced some loss of depth in areas of the engraved lines (the high-relieve lines in the tool are obviously breaking or wearing away with usage). I had to re-scribe everything. The most difficult re-scribing were the six ovals that represent the torpedo tube shutter doors at the bow. Careful cutting with a #11 blade, followed by some freehand work with a scribe corrected the depth problem and also straightened things out a bit. One I could get the scribe to track properly I overcoated the TT shutter door area with filler, chasing out the engraved ovoid with the scribe to clear out the still soft filler. I then went on to other tasks.

Would you believe a one-gallon can of DuPont Lucite Fill 'N Sand 131S acrylic lacquer primer is now over $120! But nothing fills, sands, and holds up against all paint systems like this stuff. I shoot my 131S with an old Paache airbrush equipped with the #3 tip, using about forty PSI of air pressure. I cut the primer thick for maximum fill. I only thin this primer significantly when laying down the pre-paint primer coat. You can use this stuff straight from the can as a putty (what the hell do you think that outrageously expensive, 'Mr. Surfacer' is, anyway?).



Some original and some new engraved lines. The new 'sonar window' outline at the front of the sail is my work, as is the laid-back access door just under the window. This thing is getting pretty close to the paint-the damn-thing-and-be-done-with-it phase. God, I'm sick of this thing! ... I want to build a spaceship, Damit!

Again, through the efforts of Wayne Frey, we are learning a great deal on how the actual ALFA class boats look. I hope, sometime in the near future to apply Wayne's info and produce a proper 1/96 scale r/c ALFA hull kit. Stay tuned, sports fans.

With the hull secured in the holding fixture, and with the aid of the surface-gauge and right-triangle, I assured that all surfaces were attached in near perfect cruciform fashion. Note that the base of each stabilizer and on the hull where each stabilizer fit was scored deeply to provide additional contact area for the CA and later introduced epoxy laminating resin to bond the items together. The cheat marks on the hull and stabilizers assisted as I tack glued the stabilizers in place with thick formula CA adhesive.

Before mounting them, I drilled eighth-inch diameter holes through the base of each stabilizer through which I introduced epoxy laminating resin to do the real adhesion job. Later, during the filling work at the fillet unions to the hull, these holes were filled and a seamless union created between stabilizers and hull. Note the cheat lines on the hull and stabilizers, used to assure correct placement of stabilizer on hull.

The raw cast white metal propeller needed a lot of work with files and sandpaper to knock down the flash. You can see an untouched propeller to the left and the worked propeller to the right. Later pickling in Ferric Chloride acid will remove most of the sanding scares. The pickling also microscopically pits the metals surface, making it very receptive to mechanical adhesion of the first primer coat. A process lost to most of the cast metal figure painters I know.

Wayne Fray is responsible for unearthing simply magnificent information on the the ALFA and other 'modern' Soviet and current Russian submarine designs. Hell, Wayne's even traveled to Russia on research missions and has actually made friends with those within the Russian submarine building and driving communities. Photos, plans, and other material relating to the ALFA has been most graciously shared by Wayne. This current project has been the beneficiary of 'new' information that has come to hand because of Wayne's efforts. Thanks, buddy.

One thing unearthed from the hundreds of photos Wayne has of a dry-docked ALFA is a close look at the underside scoops used to gather cooling water to the main propulsion steam condensers. The kit scoops were revealed to be way out of scale and had to be modified to more closely represent what the prototype scoops look like. The kit scoops were run through a bandsaw, then contoured to fit the hull, glued down with CA adhesive, and then filleted with Evercoat's Glazing Putty applied with a dapping tool.

Using a dapping tool as a radius contouring tool, I ran a bead of Evercoat filler around each installed scoop. The cured filler was later worked with files and sanding tools, followed by a heavy coat of thick primer to blend things together.

Just before hitting the two freshly installed main condenser intake scoops with primer. Initial sanding was done with a rolled up piece of #100 sandpaper, followed by a piece of rolled #240, then a few licks with #1000 steel wool.
Every now and then it's a good idea to integrate as many subassemblies as you can. This done to check for noninterference between moving items (propeller drive shaft and control surface yokes, for example).

... OK, and because its nice to see what the thing looks like assembled, too!

Fine! You caught me. Can't wait to get this beast into the water.

1/72 ALFA Turnkey Build, Part-6

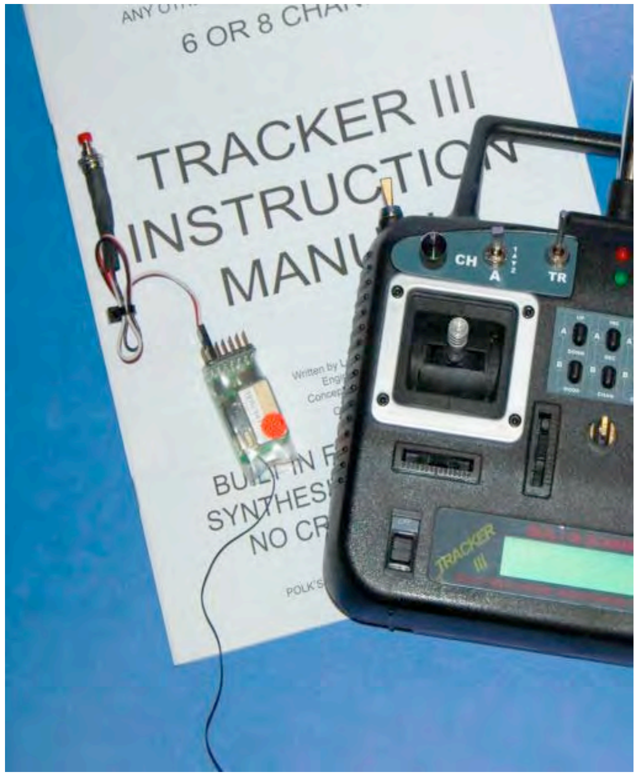
Some filler at the stern to fair in the stabilizers with the hull, some filing and sanding, a blast of primer, and that job was done.

I then took one of my stock WTC-3.5 cylinders and modified it by removing about two inches of cylinder from the after dray space, and removing that portion of the forward cylinder were the variable ballast tank piston went and plugged the hole with a cap. I then took the devices and r/c system and began the task of testing everything on the bench, and once satisfied that it all worked, installed the gear into the WTC. This is my first exposure to the Polk's Tracker-3 r/c system (and the associated Seeker-6 receiver), and I must say that I am most impressed with this gear.
Look out, Futaba!

I installed the stern control surfaces, yokes, and pushrods; made up an intermediate drive-shaft (that fits between propeller shaft and WTC), making things ready to integrate the submarine mechanical items with the WTC's mechanical outputs. The kit supplied WTC saddles were CA'ed within the lower hull -- a brass pin set in the forward saddle mates with a hole punched into the cylinder (in the ballast end of the tube, of course) to assure WTC indexing within the hull. The means of securing the WTC within the hull are two rubber bands that cross over the top of the cylinder and make up to hooks atop each saddle. The single gel-cell type lead-acid battery fits in the lower hull, just forward of the WTC.

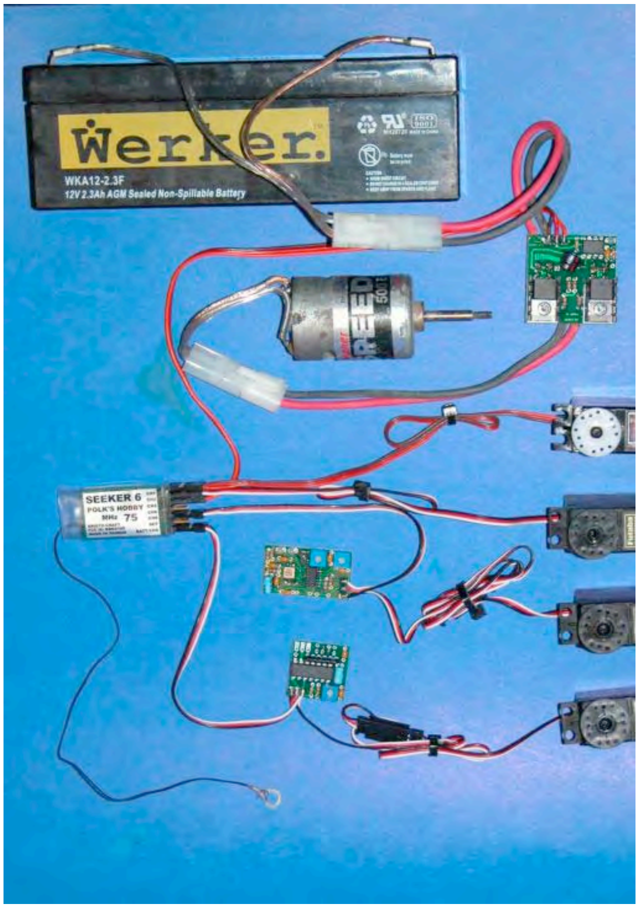
Things are moving along at a good clip now, I should have the 1/72 ALFA in the water later this afternoon. More to follow.

Though the root of each of the four stabilizers represented the 'fillet' that fairs in these structures with the hull, there still remained the work of filling the seams between the hull and stabilizers. This was done with the thicker Evercoat Glazing Putty pushed into the seams with a finger. Once the filler had cured it was worked with round files and tightly wound rolls of descending grits of sandpaper. Finally, the fillet areas were shot with primer and I went on to other tasks.



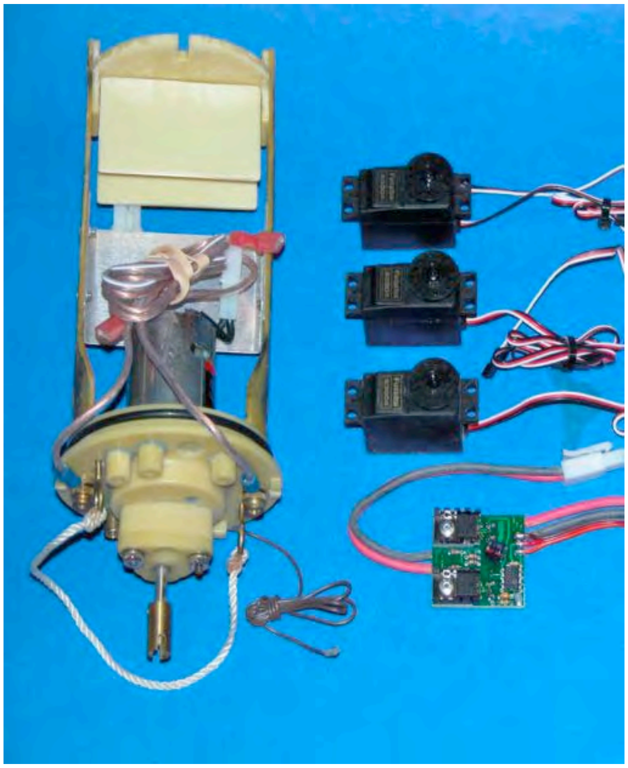
My client sent me this excellent Polk's Tracker-3 r/c system. This non-crystal radio permits you to select any frequency within your band (in our case, the 75mHz band) and to not only select it at the transmitter, but also the receiver. A quick receiver setup is done with a removable push-button -- you can change transmitter and receiver frequencies at the field. The system modulates as a proper FM/PPM wave form and presents no interface problems to the Thor Design and Development devices.

Being a proper 'computer' r/c system, the Tracker-3 permits all adjustments, and most mixing functions. you would find in the more expensive 'helicopter' systems. I have yet to operate this radio with the model in the water, but so far, during all phases of bench testing, I must say that the Tracker-3 is most impressive!



Before outfitting the water tight cylinder (WTC) with the servos, receiver, speed controller, and other devices needed to control the model, I first hooked everything up, off WTC, and checked things for correct operation. Shoe horning everything into the tight confines of the WTC is not the place to trouble shoot system problems!

There were two firsts with this project for me: Use of the Thor Design and Development angle keeper (PC-5A), and fail-safe (MFS, MicroSafe, fail-safe), and the r/c system: the Polk's Tracker-3 transmitter and Seeker-6 receiver.
Short version: So far I have found no incompatibility issues between Matt's electronic devices and the Polk's r/c system. And that's what the initial off-WTC setup and testing is about: to verify correct operation of all components with one another before they are mounted in the WTC.

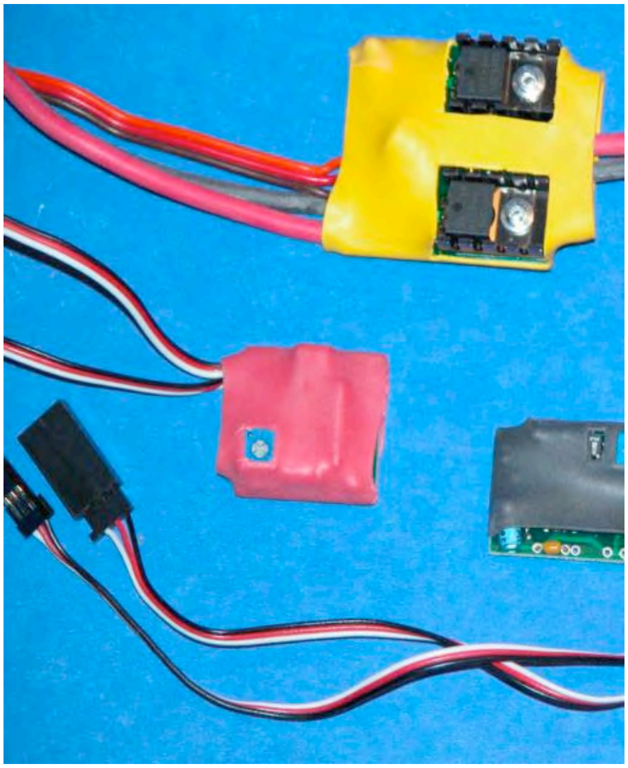


The WTC's motor-bulkhead pulled out of its cylinder and the devices that will mount on the equipment bulkhead and servo tray. The Seeker-6 receiver is so damn small! So to are the angle keeper, and fail-safe! Things have changed so much in the last fifteen years!

The upper shelf of the equipment tray was removed and a teeter-totter mounting tray made to mount the angle keeper. A pushrod making up to the tray permits me to externally alter the angle of the angle keeper so I can make fine adjustments of the submarines zero point without tearing into the WTC itself.

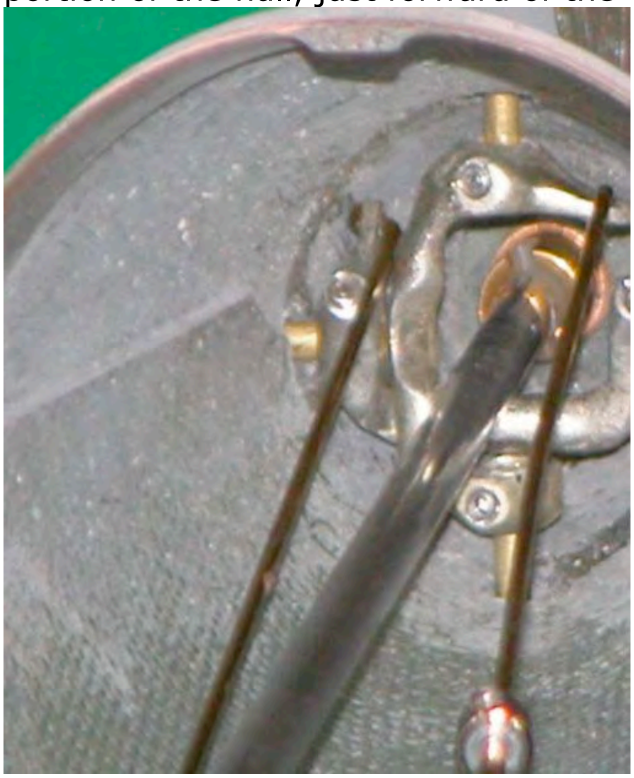
I modified one of my stock WTC-3.5's by removing the adjustable piston from the ballast tank and substituting an end cap. I also short ended the after dry-space within the cylinder by about two inches.

Since the invention of the WTC-3.5, the size of the electronic devices has dramatically been reduced, permitting installation of this equipment in a much smaller volume. As with all my private and commercial WTC's, I employ a gas type ballast system. Propel gas as the means of pushing the water out during the blow cycle.



It's my practice to wrap all bare circuit boards in heat-shrink tubing. No matter how careful you are mounting bare-ass boards in a WTC, someday you're going to short a vital component and slick your expensive device. You have to take care not to short across the pins on the board -- and don't think that you can protect the bare circuit pins by laying the face of the device onto some double-sided adhesive tape ... some of those tapes are semi-conductive and if they don't outright kill the board, they will cause changes in circuit performance. Best to protect the board in heat-shrink like I do.

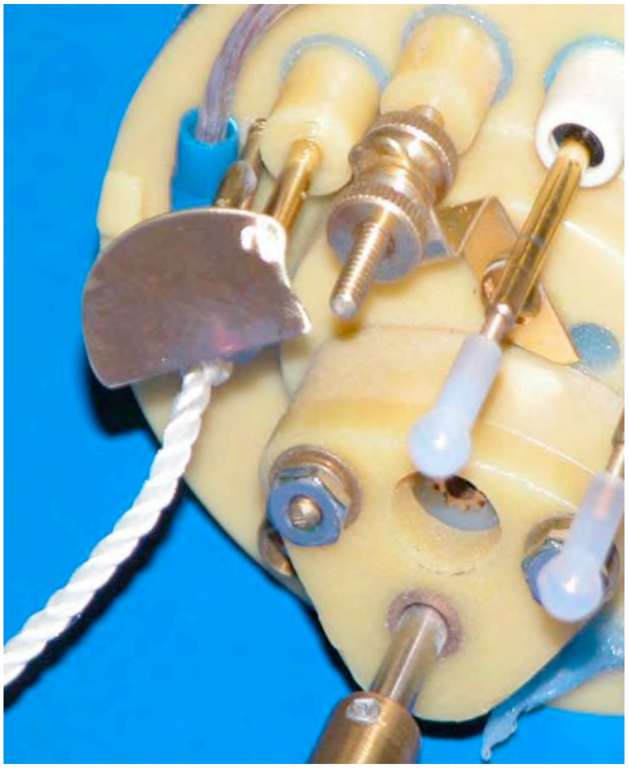
The WTC-3.5/ALFA, battery and saddle equipped lower hull. At this point I have already installed the stern control surfaces, made up they're internal yokes and have made up pushrods to control stern planes and rudders. The battery of choice here is a lead-acid, gel-cell type, this one with a capacity of about four Ampere hours -- enough to run the ALFA for over an hour. Battery change is simple and quick as it is stored in the wet portion of the hull, just forward of the WTC.



The yokes that interconnect the opposing rudders and opposing stern planes. I produce these as white metal castings that come as standard fittings with the kit. The job of the yokes is to permit an unobstructed passage of the centrally running intermediate propeller drive shaft. Note that the operating shafts of the control surfaces are engaged by set-screws at the ends of the yokes.

Oversized holes in the yokes take the control surface operating shafts -- which have to come into the hull at an angle (necessary for them to clear the outboard tips of the stabilizers. But, once the control surfaces are captured within their respective stabilizers and you tighten down on the yoke set-screws, things straighten up and you get a good solid interconnection between the opposed pairs of control surfaces. An integral item of each yoke is a bell crank which accepts the Z-bend at the after end of a pushrod.

Skip Asay wrote some time back on how to spring-load a pushrod so that a 'pusher-plate' type interface between hull mounted control surface linkage and WTC pushrod could be made without need of special tools or effort as the two hull halves are joined or taken apart. That system was copied here to facilitate hookup between WTC and hull bow plane linkages. At the extreme after end of the bow plane push rod is its adjustable pusher-plate. Not installed here for clarity sake is a rubber band that keeps a tension on the plate, forcing the bow plane pushrod forward. It's that tension that keeps the pushrod pusher plate engaged with the WTC pusher-plate.



We're looking at the wet side of the WTC motor bulkhead here.

Pay attention to the four eighth-inch diameter shaft seals set into the face of the bulkhead. These are a recent development of mine: the single white one has been machined to take a cup type seal, the other three have cast-in-place double-seal type O-ring. These are quick and cheap to produce. From left to right lets talk about what these WTC pushrods do:

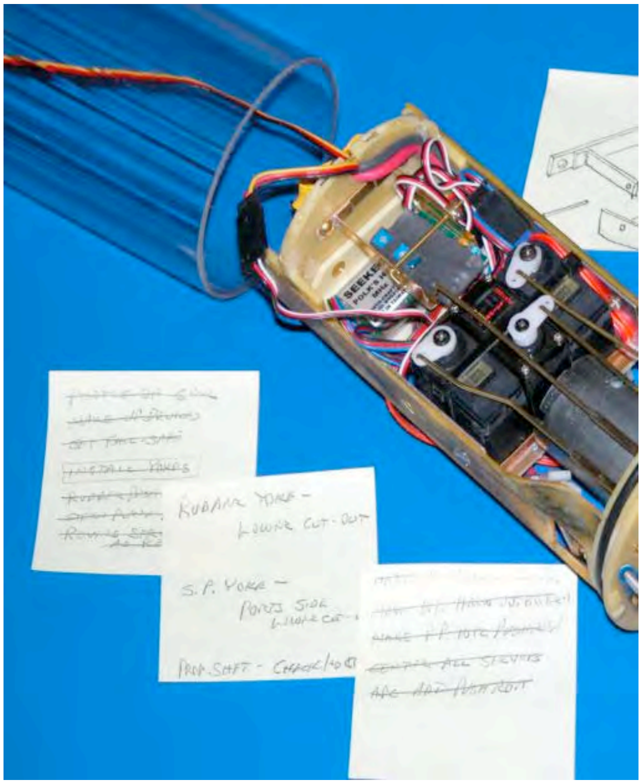
1 The WTC bow plane pushrod after end terminates in a brass pusher-plate. This butts up tight against the spring (rubber band, actually) tensioned bow plane pushrod pusher-plate. This arrangement permits me to quickly make up the linkage between the WTC (in the lower hull), and the bow plane (in the upper hull) during assembly.

2 Angle keeper tilt adjustment. The two thumb nuts, either side of the brass bracket, screwed either in or out, work to push or pull the WTC pushrod in or out to physically tilt the angle keeper within the cylinder. This adjustment feature permits quick zero-point adjustments without need of either entering the WTC or removing it from the hull. This items concept stolen from Jeff LaRue.

3 The rudder WTC pushrod This, as the stern plane WTC pushrod, terminates in a Du-Bro cup connector, which makes up to a ball connector that terminates at the forward end of the rudder pushrod. The reason this seal is white and uses a cup-seal rather than a cast-in-place double-seal was simply because the stock WTC-3.5 comes equipped with only three pushrod seals

-I ran out of the simple double-seal units and only had the more expensive, less friction, cup-seal types at hand.

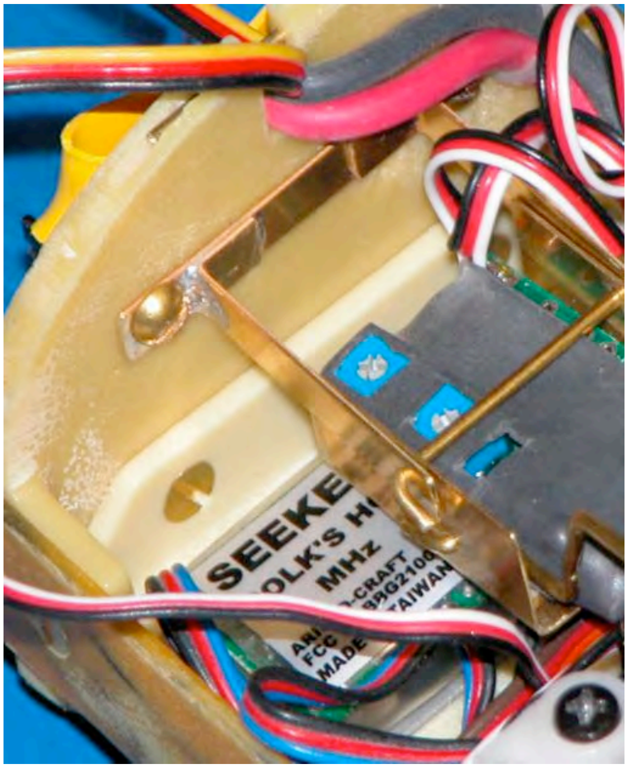
4. The stern plane WTC pushrod.



Installation of the servos and other devices was straightforward.

The servos were secured down on the aluminum tray with electrical ties and double-backed tape. The speed controller. receiver, and fail-safe were secured to the equipment bulkhead with double-backed servo tape. However, I build a special swivel-tray for the PC-5A angle keeper, this tray fabricated from soldered brass strip stock. Note that I had sketched out the tray first, basing its design on the available space at the front of the equipment bulkhead. Once happy with the drawing I made the tray.

See all the post-it-notes arrayed around the WTC? As I go about the task of testing the WTC within the hull I make notes of what problems are encountered and corrective actions needed. Getting all observations down on paper limits the number of times you have to remove the WTC and open to make fixes. Get it all done in as few operations as possible, is my motto.



The ability to tilt the angle keeper through one of the pushrods permits fine-tuning of the stern plane zero-point; the pitch angle on the boat where the stern planes are on zero.

It's been my observation that most boats require a zero-point where the boat assumes a two to five degree down angle. I assume this is needed on a correctly trimmed boat owing to the 'surface capture' effect of a submerged object traveling along at less than three hull diameters beneath the surface; the slight down-angle, with the attendant dynamic downward 'lift' generated by the hull, works to counteract the surface capture phenomena.

Though the PC-5A angle keeper has an angle adjustment potentiometer, it's a much more efficient means of changing zero-point by actually tilting the angle keeper within the WTC - letting gravity, not electronics, do the work of setting zero-point.

1/72 ALFA Turnkey Build, Part-7

Last things to do before getting this puppy wet in the kiddi-pool for trimming was to install some fixed ballast weight low in the hull, and buoyant foam high in the hull, just under the designed waterline. That exercise to produce a significant metacentric height, needed to make the submarine statically stable about the pitch and roll axis.

Of Fixed Ballast Weight and Buoyant Foam From the drawings I lofted the designed waterline onto the hull with a waterline marking tool (surface gauge equipped with a Sharpie pen). I then transferred that line to the inside of the upper hull -- the objective of buoyant foam placement (to counter the weight of the hull, battery, and fixed ballast weight) is to place it longitudinally so that its center of force is directly over the models center of gravity. I don't have the schooling to work that out mathematically, so I find the correct amount and location of foam through experiment -- many trips between shop and pool. Also, it's important to keep that internal foam beneath the waterline, else that portion of foam mounted above the waterline becomes useless when the submarine assumes surface trim.

There are two vertically pulling and pushing forces involved here: gravity, the downward force, and buoyancy (a consequence of gravity), an upward force. Submarine (and blimp) static stability about the pitch and roll axis is attained when the collected masses aboard the vehicle -- that fixed point called the center of gravity (c.g.) -- is a significant distance below the center of buoyancy (c.b).

The amount of static stability such a vehicle possesses is a function of the vertical distance between the c.g. and c.b. (the metacentric height). The greater the vertical distance between the c.g. and c.b., the greater the moment arm between the two lines of force, hence the quicker the vehicle will return to a stable condition after being upset by an outside force. You put as much weight low in the hull as you can cram in buoyant foam to counteract that weight and still achieve designed waterline with an empty ballast tank.

A word of caution here: I'm describing static stability, where gravity (a constant) produces a downward force and an upward force (buoyancy), static stability forces are constant (disregard the quantity of water in the ballast tank for a moment, smart-guy!) and are always at work on the immersed submarine, be it in surface or submerged trim. Those forces at work regardless of the motion of fluid around the hull. But, keep in mind that the static stability righting forces are of a very low magnitude and do little to right the submarine once it is in motion within the fluid, subject to the upsetting forces (of relatively high magnitude) that result as a consequence of the vehicles motion through the fluid.

Talking of a vehicle moving through a fluid, now's the time to describe 'dynamic stability': Dynamic stability is the stabilizing forces, generated by the form of the vehicle, that keep the vehicle centered in a fluid stream; these stabilizing forces (working about the pitch and yaw axis) are a consequence of

the relative motion of the vehicle and fluid. Dynamic stability is built into aircraft (OK, some high performance jets don't, they give up stability for maneuverability), lawn-darts, Estes rockets, badminton
birdies, dirigibles, and submarines.

Center Of Gravity Considerations Where the c.g. falls, longitudinally, on the hull is important for two reasons. First, the c.g. is, disregarding fluid forces on the moving hull, just below the vehicles center of rotation about the vehicles pitch and roll axis, and right on the vehicles yaw axis. The greater the vehicles control surface distance from the center of rotation (moment arms), the greater the force they exert about the axis point. But, put the c.g. too far forward and the boat becomes overly dynamically stable A big problem with those huge, do nothing stabilizers that surround the horizontal and vertical control surfaces (rudders and stern planes), killing the leverage gained from the long control surface moment arms.
With the c.g. too far forward the boat is too dynamically stable; the boat is difficult to steer about the yaw and pitch axis; the pitch and yaw rates are low. However, if you position the boats c.g. too far aft the boat becomes either dynamically astable (presenting to righting forces regardless of angle presented to the fluid stream) or unstable (the vehicle reorients and becomes stable at an undesired orientation to the fluid stream), making the boat a total Bitch to drive. Good drivers strive for a boat that is astable -- the boat has good pitch and yaw rates, but requires constant attention by the Driver!
The center of pressure (c.p.) on a vehicle is the point where the collected fluid forces gather on the hull -- a consequence of the friction produced by the fluid in contact with the vehicles outer envelop. Again, it takes considerable math skills to work out a specific shapes c.p. But, you can work out a good estimate on paper. For idiots like me you simply make a profile drawing of the vehicle on graph paper and count the number of squares, you then find the longitudinal point on the drawing where the number of squares aft is equal to the number of squares forward, call that your models c.p. You want the models center of gravity (determined easily with a sling on the model) to be a bit forward of or on the c.p. (determined from the graph-paper study). Remember, an over-stabilized boat is a boat that is hard to turn!
But, to be real for a moment: most of use don't go through this skullduggery. We just plop the c.g. at the halfway point along the hulls longitudinal axis and work things from there, and it almost always works out just fine. Almost always.

Pool Trimming Before you even think of taking the model to the lake you want to have the submerged and surface trim worked out (through the correct amounts and placement of internal fixed ballast weight and buoyant foam). I use Rose's little kiddi-pool for that duty -- a card table set up next to the pool keeps me from having to march back and forth between shop and pool; all adjustments to foam amount and placement done at the pool-side table. In the case of this ALFA job I invested only three hours in the task of trimming it out -- but only because I have build a few of these models for myself and other customers; I pretty well knew from experience where and how much weight and foam to install in the hull.
The kiddi-pool is where you also wring out real and potential mechanical/ electrical/electronic items;

where you 'burn in' the complete system: The motor is run on 'full-ahead' for a few minutes as you look for loose setscrews in the running gear; the fail-safe is checked for its ability to blow the ballast tank after turning off the transmitter (simulating loss of signal); and the angle keeper and BEC are subjected to 'real life' loads to see that they do their jobs properly. And its at the kiddi-pool, with the submarine submerged, where you range check your r/c system -- you do this with high-throttle on (someone holding the model, of course), as you want the lest favorable conditions for r/c reception and interpretation of transmitted signals going on during the range check.

Initial Sea Trials - Trashmore Lake! I grabbed the girls, tossed the field box and ALFA into the van and made the ten-minute trip to our local park, Mount-Trashmore. A fine site with a gentle slop to the water that goes out about a hundred feet before it's over your head. The site is perfect: sand so you can bounce off the bottom without damage, and a gentle incline to deep water which means you can operate a boat there and loose it to the bottom with a very good chance of retrieving it without having to break out the scuba gear.

Things are warm now, and the water is not too chilly, we had a stiff eight-to-ten MPH inland wind. The boat was trimmed a few ounces light in submerged trim and about an inch of sail would project into the air. The inland wind would push the model back to me if, for whatever reason, the submarine went 'dead-stick' on me. So, connecting the propulsion battery, charging the onboard ballast system bottle with a squirt of Propel, wiggling the controls and screw, everything working, I marched out, put the thing in the water and ran it around on the surface a bit. Yup, same old typical ALFA awful turning radius ... so what else is new? Having half the available rudder area swinging limply in the wind does nothing for surface trim turning!

Finally, completing a lazy circle close in to shore, I pulled the plug, and the model descended quickly to decks awash ... a bit of throttle, down-planes, and the model was at periscope depth in good time. I had the stern planes on one of the transmitters little rotary knobs, so I used that as a big trim feature and dialed in enough stern plane to keep the model dived. The majority of the depth control chores easily handled by the bow planes (right stick, up/down axis). I love this Tracker-3 r/c system!

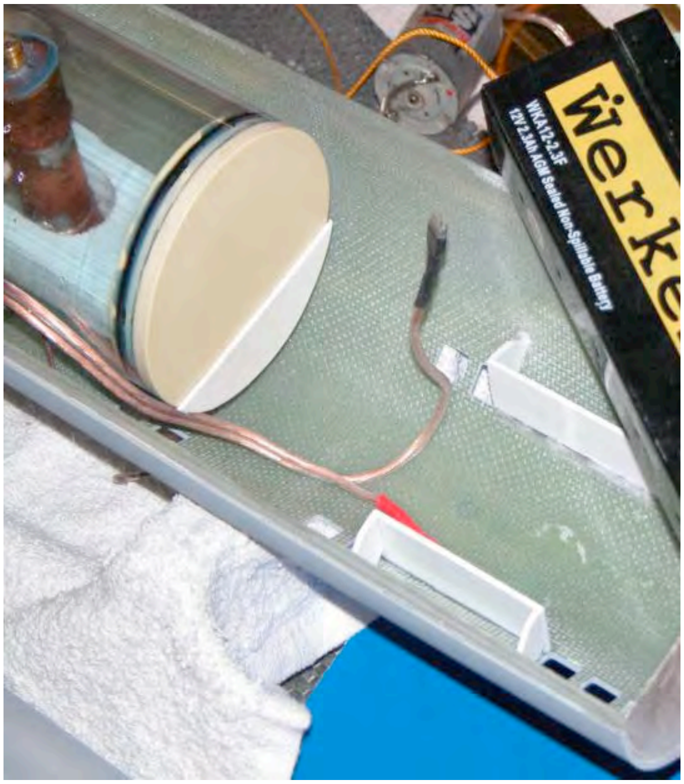
I ran the boat for about thirty-minutes, and found the top-end of the throttle to be very, very fast (No! Not German fast ... American fast, OK?). The boat was stable throughout the speed envelop. Very little torque induced roll was observed, indicating that the metacentric height on this model is adequate. Overall, the boat ran very well this first time out. However, I did have a range issue: it went dead stick only seventy-five feet out once. Don't know why, And I think I tripped the ESC overheat breaker a few times. But, the underwater turning radius was the best of any ALFA I've built and operated to date - I suppose pushing the c.g. back a bit, as compared to the other builds of this subject, explains that. Overall, a very successful outing.

Using the graph-paper trick to guesstimate the center of pressure on the hull (this done before installing the WTC) I marked the hull with that point. The ALFA -- because of the over-stabilizing job those monstrous stern vertical and horizontal stabilizers do -- has a very poor turning rate. Therefore, I place the vehicles c.g. right on the estimated c.p. Only then do I install the WTC saddles, so positioned to put the center of the ballast tank right at the c.g. (which, as explained above, is the same longitudinal location as the eventual center of buoyancy. Above you see the c.p./c.g. mark and the mounted WTC, with its ballast tank centered on the mark. Now, to place enough fixed ballast weight into the hull to lower the vertical component of the c.g. while at the same time fixing the models c.g. at the indicated point.

How many of you go through this nonsense when you set up your boat? Ha! Thought so!

Determining the actual c.g. of the model is a simple matter, a cord is used as a sling and the model lifted off the cradle with it. I estimated that fifteen ounces of lead weight would be enough and placed it atop the hull, moving it back and forth until the model would balance at the indicated mark. Note that the weight wound up just forward of the radial hull break -- perfect! Well clear of the battery.

After finding the longitudinal position for the fixed ballast weight with the sling, I rolled the model over and drilled holes to pass 6-32 machine screws. Threaded holes in the lead weights accepted the fasteners, tightening the weights up tight against the inside bottom of the bow. And this is the condition I took the boat out for trimming and initial sea-trials. If need be I could reposition the weights simply by unscrewing the fasteners and relocating the weights elsewhere. Once I complete sea trials the screw heads are coated with slow cure epoxy to fix things permanently in place.



As it turned out, the space between the forward bulkhead of the WTC and the transverse structural bulkhead at the forward end of the hull was a sixteenth-of-an inch longer than the length of this gel-cell batter. Perfect. Note that I installed a plastic sheet shim on the lower face of the WTC bulkhead to make the battery a jam fit longitudinally. I also built and CA'ed down a set of transverse restraints for the battery -- and that's all that is needed to keep the battery fixed in position. Not to worry about the battery falling out if the boat is inverted, the later floatation foam sheet placed within the upper hull would push down on the upper face of the battery, keeping it in place.

After installing the fixed ballast weight well forward to get the vehicles longitudinal c.g. at the center of the ballast tank (which in turn was placed at the assumed center of pressure) came the chore of installing enough buoyant foam within to do two things: produce enough lift force (this force added to the natural displacement of all items exposed to the water (hull, battery, WTC, fixed ballast weight, linkages, fittings, etc.) to equal, with a few ounces extra, the total vehicle weight. So, how do I know how much and where to put all that foam?

Beats me, I'm a dumb-ass got-throughhigh-school-through-the-skin-of-my-teeth idiot! I had to work that out through experiment in Rose's kiddi-pool. But, with this model I had the advantage that I had built others of the type, so I was able to get the foam placement and amount just about right the first try.

Here you see the foam installed and ready for the first dunking in the kiddi-pool. Though I show a big 'log' of foam on the table, I was able to accomplish all foam work with standard three-quarter inch thick closed-cell polystyrene insulating sheet.

Prior to taking the model out to the front-yard kiddi-pool I marked the hull with the designed waterline using a Sharpie marker pen mounted on a surface-gauge. Below is the source document from which I established the location of the waterline on the models hull. So marked I then conduct submerged and surface trimming with the assurance that I know where the surface trim waterline should fall with the ballast tank empty.

Using the Machinist's surface-gauge as a waterline marking tool. The pen tip maintains a constant height over the flat table. The model is given the required up-angle to get the pen to mark the correct waterline. This operation only took moments once the height of the pen had been established and the angle of the boat on the cradle determined. This same operation will be repeated after the initial black and red goes down to again establish the waterline. However, in that operation I'll use a light pencil mark to indicate where to paint the long white 'boot topping' band that girdles the hull.

We keep a kiddi-pool out in the front yard for Rose. It also serves as my own personal 'test tank.' Here I've filled the ballast tank and I'm pointing to the desired submerged trip: just the top of the sail sticking out of the water. When initially trimming a submarine its best to keep a few ounces of reserve buoyancy aboard -- not in the ballast tank, you want that completely flooded! It was during this initial trimming phase that I punched several eighth-inch diameter hull vent holes atop the hull, and one atop the sail, necessary on wet-hull type r/c submarine models to insure that the wet portions within the hull flood completely.

I'm using one of the three-position switches on the Tracker-3 transmitter to operate the ballast system. Blowing the tank from submerged trim brings the model up to surface trim. Here I'm pointing to the designed waterline marked on the hull and how it, magically, falls even with the surface of the water. Damn! I'm good! It's the carefully worked out of the amounts and placements of internal fixed ballast weight and foam that permits the model to assume correct submerged and surface trim. Always trim from a completely full (submerged) or completely empty (surfaced) ballast tank.

At Trashmore Lake, ready to plunk the ALFA into the water. The key to a successful outing at a remote lake site is a well packed field-box, like the one you see to the left: tools, foam, weight, adhesives, a fresh can of Propel, repair parts, and fasteners are just some of the basics. If you're going to stay a while at the lake then you should also pack extra batteries.

We're lucky here, the city of Virginia Beach operates a world-class community park in the form of Mount Trashmore. The nearby lake is a favorite for regional model boaters, and the place is not far from home.

Damn ... I've gotten fat again! I blame it all on old-man Winter! Time to step up that exercise program.that exercise program.

That modest hill on the other side of the lake is our very own Mount Trashmore, an old garbage dump that had been capped with a thick layer of earth -- it was the excavation of that earth that formed the adjacent basin which, of course, became Lake Trashmore. The entire area is a city managed community park -- one of the best things ever created and operated by the local government.

Hey, Fred: I'm having too much fun with your ALFA ... I've decided to keep it, and your money. Nani-nani-na-nah!

1/72 ALFA Turnkey Build, Part-8

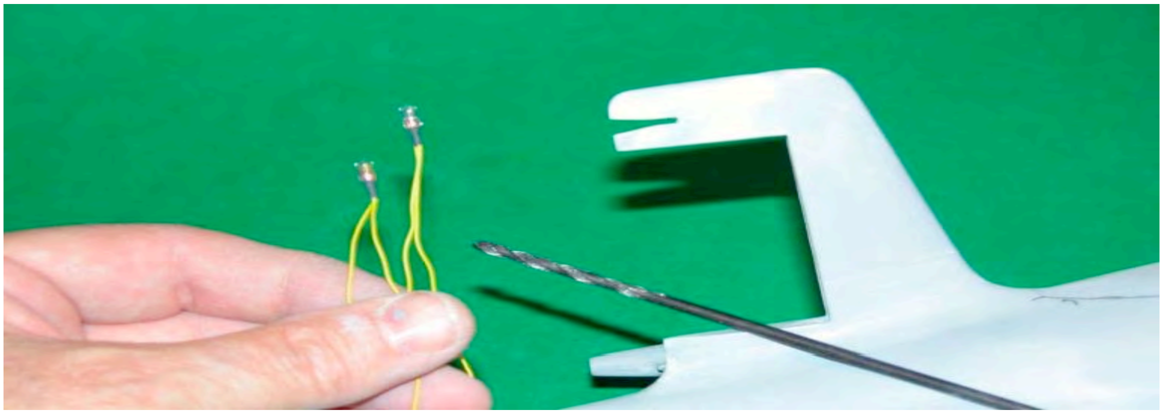
In this installment I'm outfitting the Thor 1/72 ALFA kit with practical running lights. I've elected to use incandescent type bulbs because I like the look of 'em: LED's, the so-called 'white' ones, burn with a very pronounced bluish color to them, and the yellow LED's are ... well ... yellow!

What I'm using here are the little bulbs you buy at model train shops. These things are available to burn at either six or twelve-Volts. It's a good practice to under-drive these little bulbs in this application. They burn too hot at the rated voltage and the filament will pop sooner or the glass bulb itself might shatter as a consequence of thermal shock as the hot lamp is yanked in and out of the water. As these models operate in fresh water it makes no sense to go to the trouble to make the wiring or the bulbs watertight. Electrically speaking, these lamps work as well submerged as in air.

As I worked out the installation of the running lights I set about the task of painting the model, anti-foul red below centerline, black (actually, accounting for 'scale effect,' a very, very dark gray) for the areas above centerline. Then the markings, weathering, outfitting, a final set of trim dives and test runs, and this thing is off to the client so he can join me and the other submarine driver's at the SubRegatta.

Gonna be a busy six weeks!

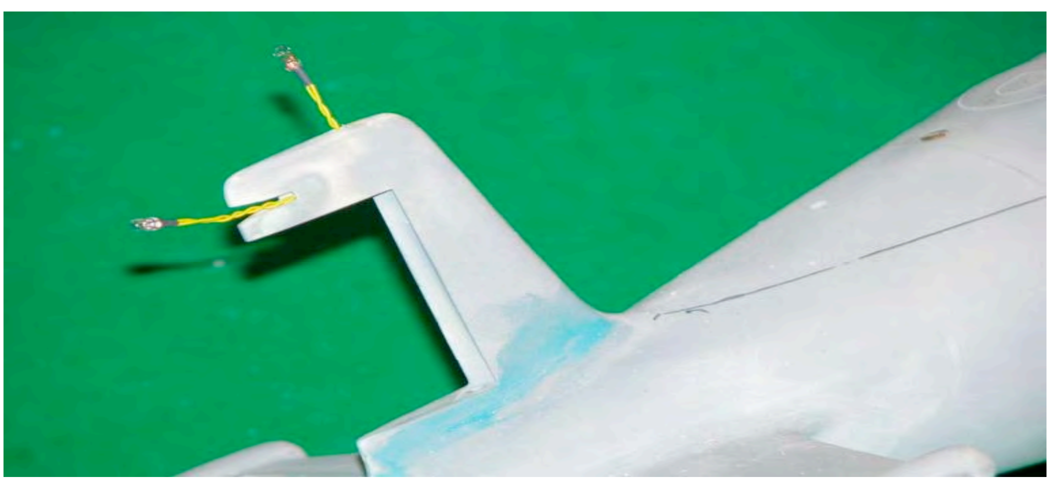
Here I've cut in with the red 'anti-foul' color to the inside edges of the flood/drain penetrations as well as the hard-to-get-at spots like the stern stabilizers and intake side of the main condenser scoops. The best choice today is the DuPont ChromaSystem paints and ChromaClear overcoat. These products are available from automotive refinishing supply houses. Though, if you want to do the painting on the cheap, the Krylon rattle-can 'red sandible primer' is a dead ringer for anti-foul red and their black is, well ... er ... black. Krylon also has a semi-gloss clear coat that isn't half-bad. So, you have choices. But, please, don't use those crappy hobby paints on r/c models -- they just don't have the mechanical and chemical robustness to tolerate typical handling and environmental hardships presented by your pizza-stained hands and the Great Outdoors!



Grain-of-wheat bulbs are fine for r/c submarine use. Here I'm showing the two units that will fit within the upper vertical stabilizer. One for the 'stern light' (that V shaped cut in the trailing edge of the stabilizer) and one to represent the 'anchor light' (which plugs into a hole atop the vertical stabilizer).

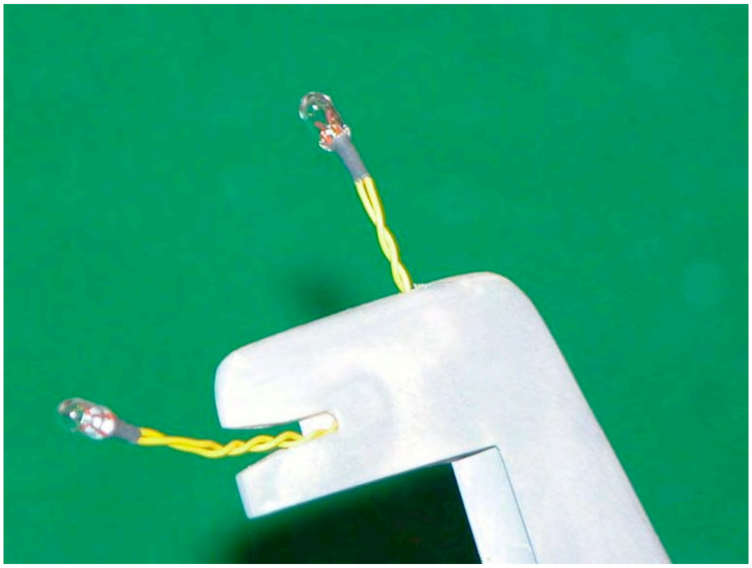
A conduit was drilled through the stabilizer, about a half-inch from the leading edge, from the top down into the hull. I used a long-shank eighth inch diameter drill bit to do this. I then drilled about four additional holes near the top of the stabilizer to form an internal 'L' shaped transition, one leg of the 'L' at the stern light location, the other end of the 'L' terminating within the hull. Of course, this turned the top of the stabilizer into Swiss cheese, but some filler covered all the holes after the fact. The objective is to form a conduit that would permit me to run the wires from the two bulbs through the stabilizer and into the hull. Within the hull the two sets of hookup wire are joined in parallel and run up to the bow where they connect to the main twelve-Volt battery through alligator-clips.

Most of the time the models running lights will not be energized. The lights are only useful for dusk and night runs -- a big deal during the SubRegatta Friday and Saturday night 'fun runs'.



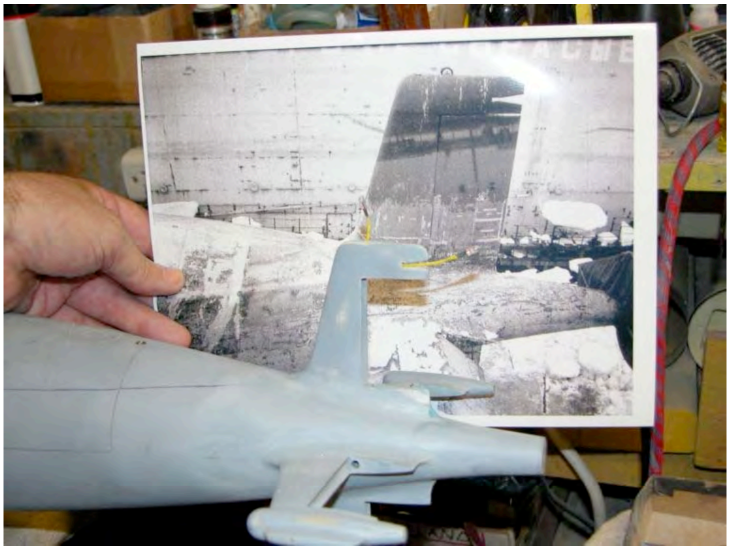
And here's the endgame: the wires of these two bulbs project into the hull, and the bulbs themselves are slipped into friction fit holes. The idea is to be able, anytime, to pull out and replace a burned out bulb with the minimum of fuss.

Why use short-life incandescent bulbs and not LED's? Because I hate that blue component to the so-called 'white' LED's. And the yellow standard LED is .... well ... too yellow! Simply put: the incandescent bulbs burn at the right color. I like 'em. And they work just fine wet. No special effort is made to make the leads or connection points watertight. If the filament fries or the wires corrode away, I just replace the lamp -- access is easy. No sweat.



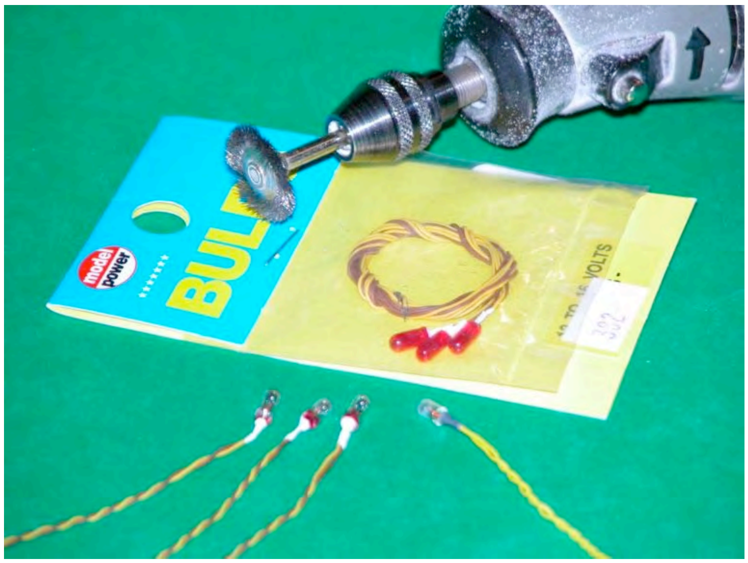
One thing I do nowadays when operating incandescent bulbs is to reduce the current by installing a resister in series with the parallel wired lamps. Of course, you have to first insure that all bulbs are rated for the onboard Voltage. In this case: twelve-Volts. The inline resister drops the current, hence the power dissipated in the form of heat, thus the temperature of the bulbs, reducing the wear on the filament and thermal shock to the glass envelops as they make the transition from air and water as the model submerges and surfaces.

By the way, the single bulb up on top of the vertical stabilizer is an 'anchor light,' and in proper underway operations would not be energized, though it is common in model submarine circle to energize it to increase the visibility of the model when submerged at night. The proper array of navigation lights (conforming to maritime law) underway is: a single white stern light; single white mast headlight; green starboard running light; red port running light and; in some situations, an amber 'submarine recognition light' mounted atop the sail.



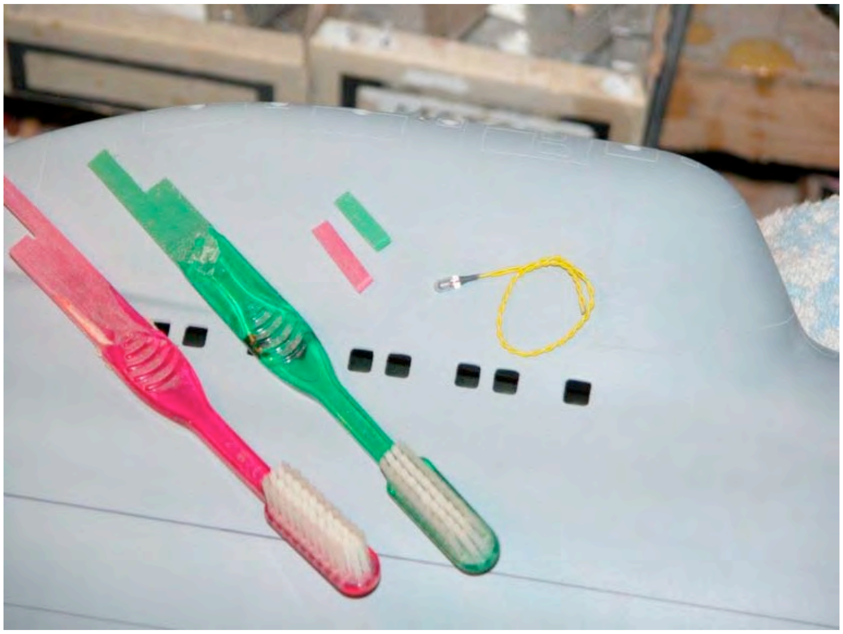
Wayne Frey provided me some simply outstanding photos of a dry-docked ALFA. Here I'm taking advantage of a shot showing off the anchor and stern light installation on the boats upper vertical stabilizer. There are several shots of this area and in not one of them do I see any indication of a clear lens over the stern light cutout in the trailing edge of the stabilizer -great! Makes my job easier.

Coincidentally, the anchor light hole falls just above the hole needed to provide a bearing surface for the upper rudder operating shaft. I'll secure the upper rudder with a short pin that will terminate just under the base of the anchor light, the larger hole above that pin accommodates the anchor light bulb. Perfect!



The twelve-Volt model train bulbs I'm using were only available here in red! However, I was pleasantly surprised to find that the clear glass bulb was only coated with a red dyed gelatin that could easily be abraded off with a little Moto-Tool mounted wire-brush, no sweat.

Different manufactures of these tiny grain-of-wheat bulbs use different lengths of lead wire. So far I've found that the Model Power brand has the longest attached leads, coming in at about nine inches -- enough to shove the wires through the upper vertical stabilizer conduit, into the stern of the hull, and still have enough wire to reach an easily accessible terminal.



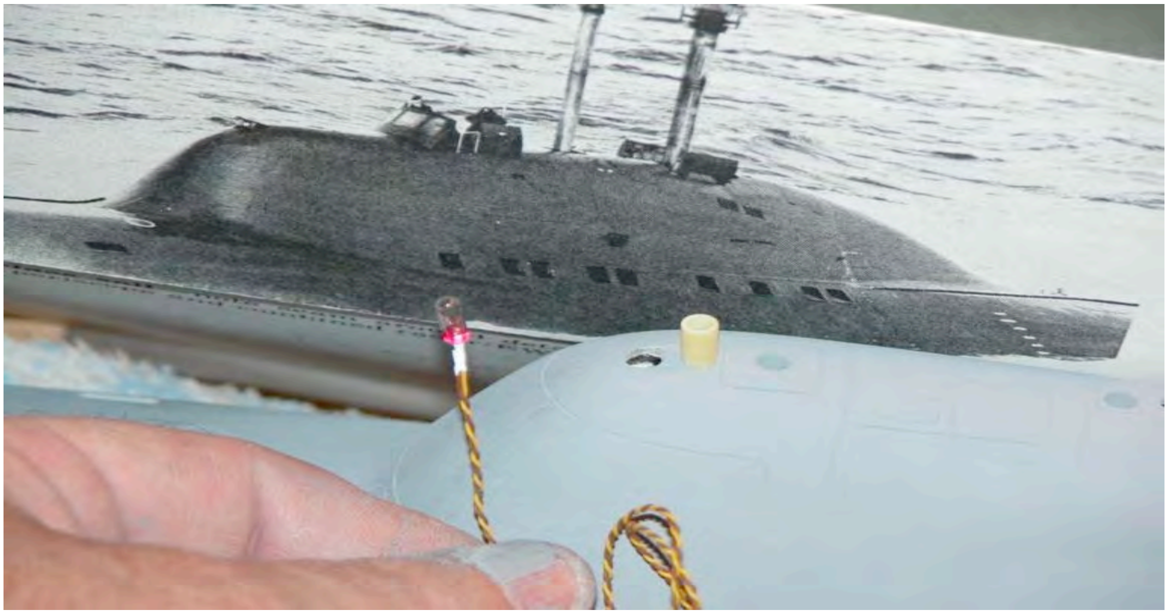
The red and green lenses needed for the sail mounted running lights were formed from pieces machined from translucent toothbrush handle plastic (an old model airplane trick). I produced rectangular sections from each color and then punched rectangular holes, one on each side, in the sail to receive them. This way I can use clear bulbs, simplifying the logistics of the running lights (Hey! Stop laughing, Subculture!). When time comes to replace a bulb I don't have to sweat whether or not I have a green or red one on hand.

Anyway, that's the way the real boats do business: the bulbs burn white, its the running light lens that projects the required red or green color.

After sticking the end of a squared off section of toothbrush plastic into the square hole punched into the sail, CA adhesive was applied and, after that had cured hard, the excess plastic snipped off with a set of dykes, about a sixty-forth-of-aninch proud of the sails surface. Final contouring is done with file and sanding block.

Question:: "What do you call a set of Philippino aviator's?" Answer: "A pair of pliers!"

Get it?!...



The mast headlight. Seen in the photo of the prototype above, fits on top of the forward slop of the sail. Though this and the two sidelights are retractable units on the real boats, for simplicities sake I'll make them fixed units on the model.

I turned a mast headlight bulb holder from a piece of discarded resin sprue turned on the lathe to a thin walled barrel. This foundation is jammed into a hole, you can see it just forward of the foundation sitting atop the sail. CA secured the mast headlight foundation for keeps. I then filed the top of the bulb foundation flush with the top of the sail. The bulb is a friction fit.

1/72 ALFA Turnkey Build, Part-9

The Soviet submarines present the model builder with a bit of a challenge. Until recently (I'm old enough to consider 'recently' as a decade or so ago) it was the Russian's practice to mark submarines with a distinctive white 'boot-topping' that originates at the designed surface waterline. This white band literally girdles the entire hull. Also, 'draft markings', consisting of horizontal short white bars, are a prominent feature of the 'evil empire' boats, as are the white boarders that mark the perimeter of deck access hatches and fittings.

How to represent these items on your model? One solution is to use either solid white water-slide decal material (that you precut to correct width and length before wetting) or to buy dry-transfer white strip (it very unlikely you will find any commercial sheets with strips of correct width and length, nor enough of them to mark out the entire model) and rub them down -- but such commercially available markings are notoriously weak of bond and are easily damaged through handling, even after a protective clear coating.

So, the obvious solution is to paint these markings on. Hand-brushing is out of the question, and lithographer pen and white ink -- though a viable solution in the hands of an expert -- is not something many casual model builders can do at all well. The surefire method, one most of you can handle, is to first mask off where the white markings go and to then spray-brush in white paint. That's what I'm showing off here: How I achieved the white markings needed to detail this 1/72 Thor ALFA r/c submarine kit.

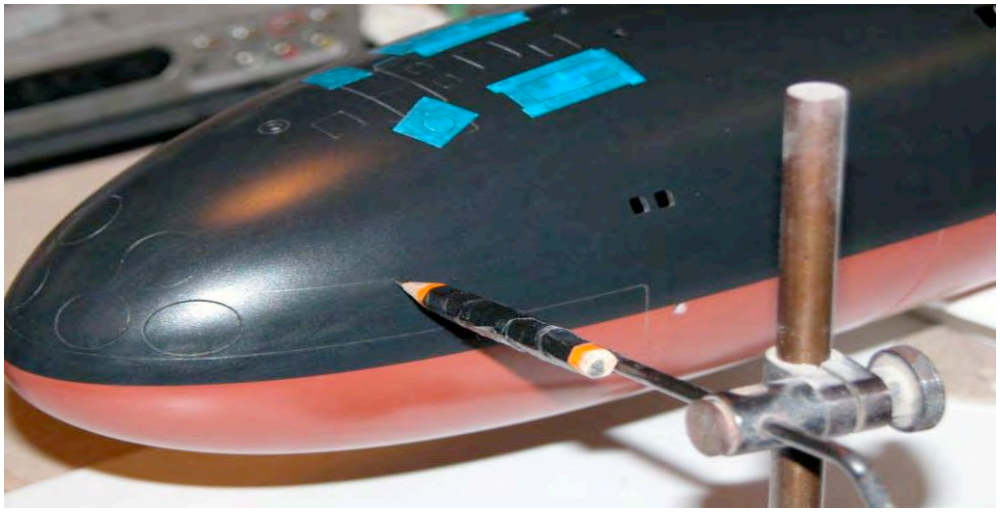
The DuPont ChromaSystem black and anti-foul red paint went down first, I then wet-sanded the entire paint job with a hunk of #2400, making the surface receptive for the markings to come.

Not wishing to reinvent the wheel, I broke out my ALFA and simply lofted from it the location and style of the white markings I needed to produce for this ALFA turnkey I'm building for a client. See how boring the model is without those many white markings and weathering!

I've already applied masking to the deck. But, before I spray on the white within all that tape, I marked off the waterline onto the hull with the aid of this pencil loaded Machinist's surface gauge.

Tracing down the waterline requires a perfectly flat working surface (its surface is the reference plane), then adjusting the models pitch angle upon its holding stand so that the pencil tip will hit the bow and stern at the correct heights -- these points lofted off of either the working drawing or a photograph of a pier-side prototype (danger, danger ... Will Robinson! Russian boats are notorious for having nearly full bilge's because of lazy watch-standing while in port, don't always trust the trim of the boat you see tied up to the pier!).

The pencil, as the surface gauge is moved along the surface of the bard, lightly marks the entire hull, denoting where masking will be applied to achieve the girdling white band that represents the boats boot-topping.

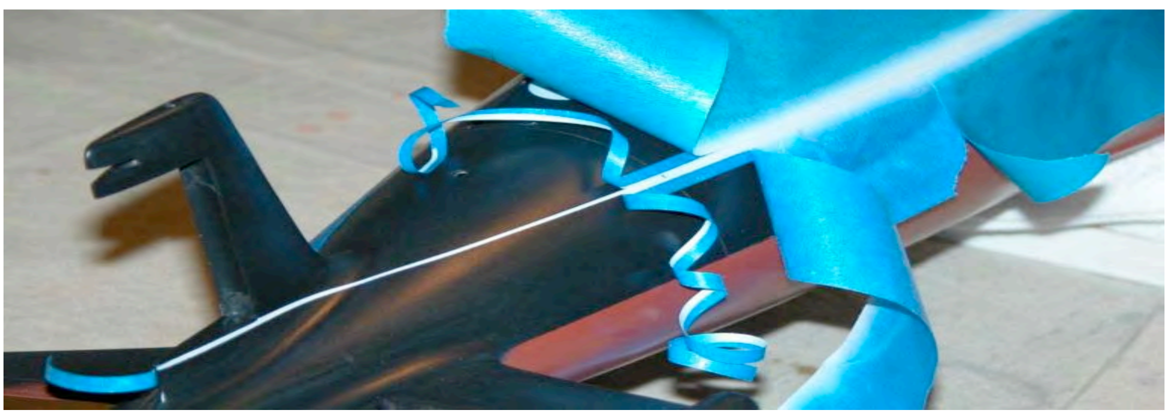


Here you can just make out the pencil line being laid down on the hull. Once I have the entire waterline marked off, I lay down a narrow strip of masking tape which is a temporary (a place keeper) representation of where the boot-toping will be applied. Then, a wide piece of masking tape is laid down atop the waterline strip and another piece below. Once I have the entire waterline masked off the stand-in strip is pulled away, its job of insuring that the two pieces of masking tape are evenly spaced apart done. Wider pieces of tape are put down to catch overspray and the work is ready for white paint.

Here you can just make out the boot-topping stand-in narrow piece of tape being pulled clear of the work after laying down the upper and lower pieces of masking needed to paint in the white boot-topping. My ALFA model, painted, marked, and weathered was used as reference. Man! This must be my fifth build of the Thor ALFA kit!
Enough, already!

Note how two concentrically mounted circular tape masks (an inner disc, an outer hole) have been laid down atop the stern. Painting within the ring formed between the tape pieces becomes a white 'DSRV target marking' over the engineering spaces access hatch.

Small pieces of scrap plastic sheet are used as pallets upon which are cut specific shapes of masking tape, be they circles (cut out with punch or compass cutter) or strips. It's a good idea to de-tack the masking tape before laying it down on the pallet -- I do this by taking the fresh tape off the roll and then wrapping it around the massive waste of my shirt. The lint the tape picks up reduces its 'stick' to the point where it will be easier to pull off the model than if it went down virgin.

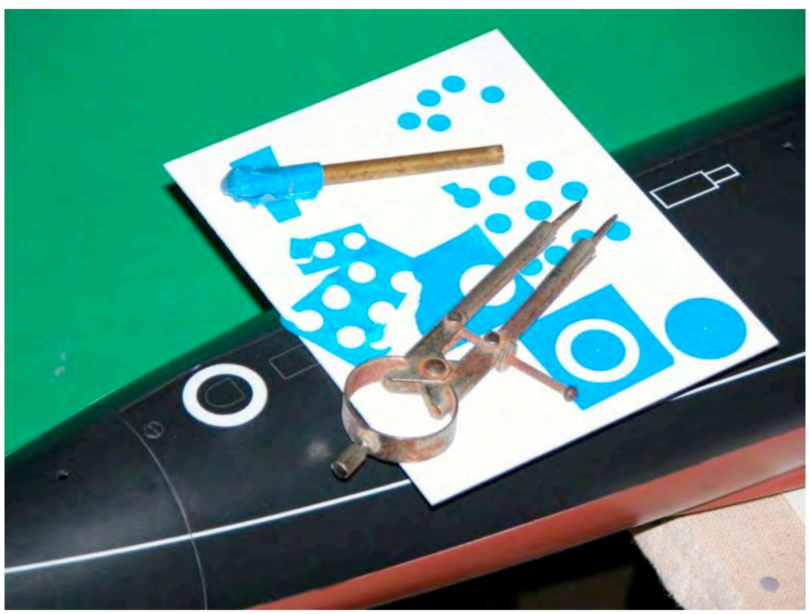


After painting in the boot-topping the masking and back-up tape is peeled away revealing the white band that denotes the designed waterline on this class of Soviet submarine.

We use the same paint system for markings as with the basic hull colors: DuPont ChromaSystem, a two-part polyurethane type automotive paint. Very quick drying, and tough as ... well ... auto-paint! Duh!

Rose removing the waterline boot-top masking from the model.

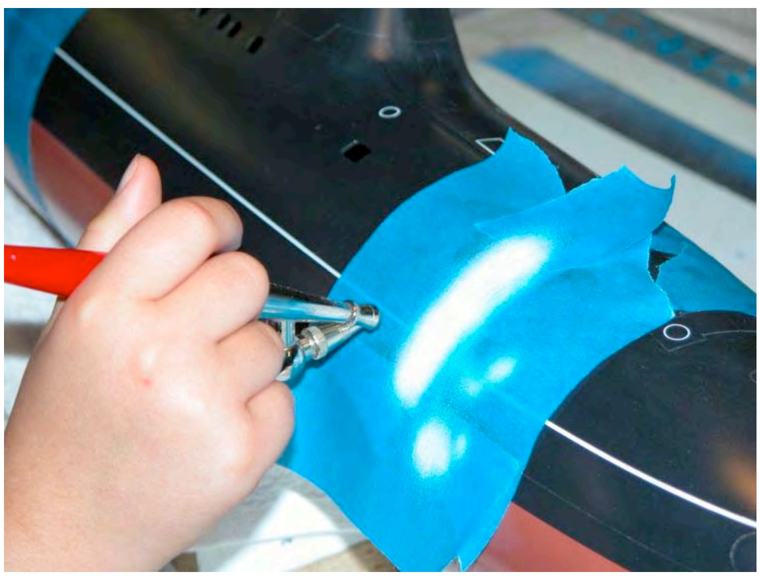
Masking tape is used like this: A long strip is pulled off the roll, de-tacked on my shirt, placed on a plastic pallet and cut to shape, the tape mask is then transferred to the model, additional scrap pieces of tape are place around the mask to catch any overspray coming off the spray-brush, the paint laid down within the masks, a brief period of time is allowed for the paint to dry, then the mask and back up tape is carefully pulled away from the model.



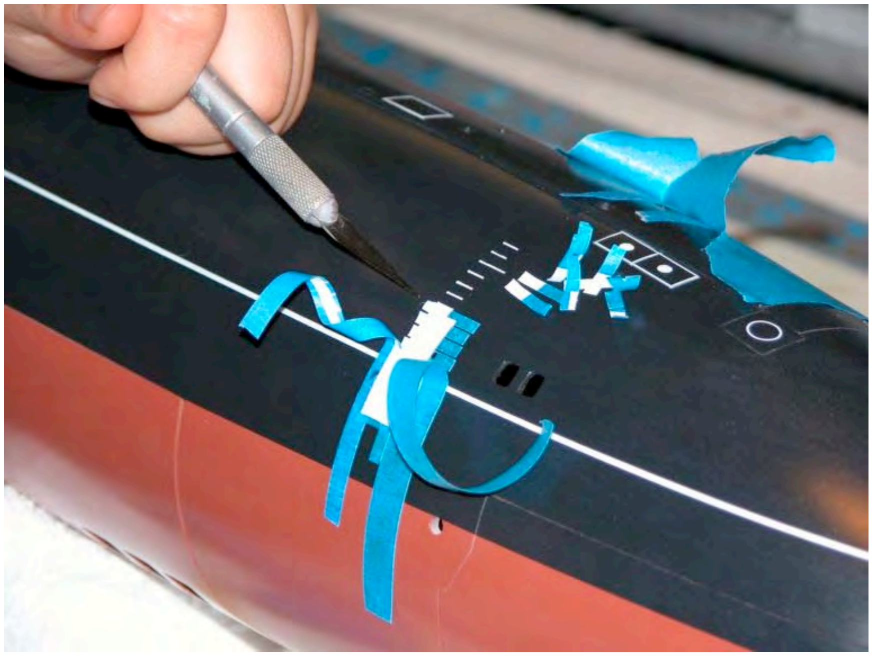
I modified a kids compass by sharpening one leg into a knife edge. This tool works much, much better than those X-Acto 'swivel knife' abortions working within the edges of a circle stencil for cutting masks. Smaller circles (and their associated discs) are cut using punch-cutters. A punch-cutter is nothing more than a length of K&S brass tube whose end has been beveled sharp with a knife and wet-stone. You can do the same with K&S extruded square tube for specific masking needs. Get imaginative, Damit!

I established the width of tape needed for the correct vertical spacing between draft marker 'bars'. Long strips of masking tape were cut out to this width on a pallet, and those strips cut to lengths slightly longer than the width of the longer bars (every fifth bare is twice the length of the others). Using the tip of an #11 X-Acto knife I lifted these the masking off the pallet and transferred them to the model.

Note that one face of the straightedge has had sandpaper glued to one face --producing a non-slip surface that won't shift on the work as I use it to guide the X-Acto blade over a big piece of tape.



Rose blasts some white ChromaSystem paint at one of the four sets of draft markings. I thin paint that will be shot through masking tape or stencils very thin and shoot it with the minimum of air pressure, about fifteen PSI. Note the larger pieces of tape placed to catch overspray, protecting the rest of the model from splatter.



Starting to remove the masking to reveal the draft bars near the bow. Lots of work to mask off these items, but the reward is a very distinctive looking boat. Soviet submarines are the sexiest killing machines on this planet in my not so humble opinion!