Edina Model Yacht Club

SAIL & SCALE

NEWSLETTER OF THE EDINA MODEL YACHT CLUB

April 1997 Volume 6, Number 4

Commodore's Corner: What's that old saying, ...April's showers bring May's.....boating ponds? Something like that anyway.

For those of you who did not attend the March meeting, we gathered in the work area furnished to the EMYC by the City of Edina. The purpose of the meeting was to expose members to several building processes and techniques particular to our hobby. One of the projects worked on was the construction of six semi-scale barges. The idea for them was borrowed from the St. Louis Admirals R/C club.

The objective in constructing barges is two fold. Number one is to give us something to push around at the open boating sessions and at the various regattas that call for "precision" steering. The other purpose of the barges is to serve as floating advertising platforms for hobby shops in the Twin Cities area.

It is the intention of the club to purchase a decent retrieval boat and electric trolling motor. The six barges will be "sponsored" by hobby shops for an annual fee of $60. The proceeds will be put toward the purchase of the retrieval boat. I know that I for one have spent far more money at the local shops than was probably prudent. Perhaps it would a good gesture on the part of those shops to return a small portion of the cash spent to those of us who patronize them. *Dan*

What's The Meeting?: Painting....hints, tips and tricks of the trade. Apparently, not everyone just uses spray cans, as does your editor.

Where's The Meeting?: As a result of the passing of the Vernal Equinox, the skating season is now over. So, the Centennial Lakes Centrum is once again available for monthly meetings. We'll see you there!

When's The Meeting?: Back to the third Tuesday!

What's Hot?: Several members asked what kind of wire was used in the foam cutter which we demonstrated at the March meeting. It is a very pricey copper based alloy called "Rene" which is used by foam manufacturers to cut hugh blocks down to more manageable sizes. Ed Berris at ProMark, 14505 21st Ave. No., Suite 206 has purchased a large supply...the only way he could get it,...and is selling it to hobbyists at $10 for ten feet. Ed has generously given me a sample. See me at the meeting for a piece. *Jim*

Danger!: While on the subject of last month's meeting, I must mention a message that I received from Ken Stoltenberg. He commented very positively on the meeting and then noted that he was "amazed to see that no one wore gloves or other protection when using epoxy"! Ken continued,"Warnings from industry are very explicit regarding the cumulative effects of absorbing the various toxins in this material. Even latex gloves are not rated too highly by some sources."

Paul Olsen states that he "always wears gloves" when handling epoxy but was not expecting to be put to work on Saturday, so he left the gloves at his shop.

(When asked to demonstrate, Paul, the consumate "good guy", dove right in without protection. Ed.)

Finally, to quote from the West System® Technical Manual, "Always wear gloves and eye protection when handling epoxy". They recommend rubber gloves. They also warn that uncured epoxy should never be removed from skin using solvents. The use of waterless hand cleanser is suggested. I've tried it, and it works!

Homepage: Last year, my son, Patrick put the club into cyberspace with our own web page. Fortunately for him, but unfortunately for us, he will receive his masters degree in May and will no longer be associated with George Washington University (the GWU in our web address). If we are to maintain a web presence, the club needs someone to pick up this ball and run with it. If you have any expertise in this field and an interest in helping us out, please call your commodore or editor.

Question of the Month: Bingo! There was some interest in last month's subject, so I'll stick with it.

If the Edmund Fitzgerald were placed on end in downtown Minneapolis, would it stand higher or lower than the IDS Center, and by how many feet?

Last month's answer: 26,000 tons.

The Gordon Lightfoot song declares, in part:

"The legend lives on from the Chippewa on down
Of the big lake they called "Gitche Gumee"
The lake, it is said, never gives up her dead
When the skies of November turn gloomy
With a load of iron ore twenty-six thousand tons more
Than the Edmund Fitzgerald weighed empty
That good ship and true was a bone to be chewed
When the "Gales of November" came early"

Well! We finally received some straight answers. The first correct caller was Joe Hjelmstad, followed by Kim Hershey and Kirk Brust.

Accuracy, Accuracy: When Kirk, our resident expert on the Edmund Fitzgerald called in with his answer to the question of the month, he advised me that his research shows that the Fitz actually had 26,116 tons aboard. Enough iron ore to make sufficient steel to build 7,500 automobiles! Wow!

Membership Meeting, 3/22/97: About 25 members showed up for the building seminar held in the club building area in the Centennial Lakes garage Minutes were not received prior to publication date.

Schedule Of Upcoming Events

Every Sunday	Open Boating	4:30PM - 9:00PM	
Every Tuesday	Open Boating	5:30PM - 9:00PM	
Every Thursday	Open Boating	5:30PM - 9:00PM	
Centennial Lakes is available for boating right now!		The water is cold, but it is water!	
Apr. 12th.(Sat.)	Toy and Model Boats Show	Hopkins House Hotel, MN	8:00AM - 3:30PM
15th.(Tue.)	Membership Meeting (Painting)	Centennial Lakes Centrum	7:00PM - 9:00PM
May. 20th.(Tue.)	Membership Meeting (Sailing Tips)	Centennial Lakes Centrum	7:00PM - 8:00PM
25th.(Sun.)	Sailing Tune-Up	South Pond	1:00PM - 4:00PM
Jun. 8th.(Sun.)	Parade of Model Boats	Centrum / South Pond	10:00AM - 4:00PM
17th.(Tue.)	Membership Meeting (Show 'n Tell)	Centennial Lakes Centrum	7:00PM - 8:00PM

Speed Controller Update: Over the past few years, several reversable speed controllers suitable for scale boats have made an appearance. We now have more than a few available which are capable of handling 12 or more volts. Listed, are those I have found in local shops and in mail order catalogs and a couple which appear to be only available direct from the manufacturer. I have also listed a handful of forward only units because of their higher power ratings, which may be favored by "fast electric" operators. "Street" prices are subject to the vagaries of the marketplace ... advertised prices changing from month to month. Note that brand name speed controllers from the radio manufacturers (Airtronics, Futaba, Hitec, JR) and R/C car units are usually limited to seven cells (8.4 volts). The extremely high currents listed on some units is a result of "poetic license" on the manufacturer's part. The theoretical capacity may be there, but in the 'real world', components such as wiring and circuit boards would be "toast" long before those levels are attained. 40 amps, or so, would probably be a more realistic limit. *Jim Smith*

Manufacturer	Model	Volts (max)	Amps (max)	Weight	List	Street	Notes
Ace	Smart Throttle	30 v	35	1.8 oz	$ 75	$ 68	
Astro Flight	#207D Hydro	60 v	50	1.4 oz.	$150	$108	no reverse
"	#214 Cracker Box	18 v	30	1.2 oz.	$100	$ 70	no reverse
EMS Jomar	Reliable Nautical	19.2 v	25	1.3 oz	$ 90		
"	Hvy Duty Nautical	19.2 v	40	1.3 oz	$100		
"	Sportmax	25 v	40	1.4 oz	$ 90		no reverse
Graupner	Speed Profi 50	12 v	35	2.0 oz.	$ 95		
Hughey	3,4 Speed mechanical	24 v	40	3+ servo	$ 45		no reverse
MCD	Super Minicon	16 v	10	1.3 oz	$ 75		
"	SC-330FET	28 v	30	5.0 oz	$125		
Novak	610-HRV	12 v	120	1.8 oz	$165	$ 83	
Robbe	RSC 535µP	16.8 v	35	3.0 oz	$135		
Sub Tech	ST-10	30 v	8	1.5 oz	$ 75	$ 64	
Tekin	Rebel	12 v	240	2.4 oz	$129	$ 68	
"	Titan	12 v	240	2.6 oz	$208	$112	
"	TSC432M	38 v	300	2.5 oz	$150	$ 95	no reverse
Vantec	RET44	16.8 v	12	2.5 oz	$ 80		
"	HW55	16.8 v	18	2.5 oz	$110		

Mold Building: The article on the following three pages is re-printed with the permission of the editor, Grace Ombry and the author, Brian Knight, from the fall 1995 issue of *Epoxyworks.* This semi annual Gougeon Brothers, Inc. publication is available by request from: Epoxyworks, P.O. Box 908, Bay City, MI 48707-0908.

The article, while not boating in nature, contains much information that we can put to use in construction of plugs, molds and eventually, multiple boat hulls. Those of us here in the North Country could even put the information to use as published. Of course, we will have no need for a snowmobile around here for four, maybe five months!

Deadline: For the May newsletter is May 6th.

I could use some help folks!. I've run dry! I'm finding it necessary to plunder other sources for information. *Jim*

Light-Duty Mold Construction

by: Brian Knight

Courtesy of *Epoxyworks*

Mold building is a straightforward concept. Way, way back when I was in kindergarten, I made an imprint of my hand in clay for a Mother's Day gift. I was given a ball of soft clay into which I pressed my hand. When the clay hardened, a permanent *reverse* shape of my hand, or mold, was created. If I ever needed to, I could coat the mold with a thin coat of wax, pour in some plaster and reproduce exactly what my hand looked like when I was five years old. I could do this hundreds of times if I so desired.

Model makers, prototype designers, or anyone who occasionally needs to make a few identical parts, can benefit from using a mold. Depending on the quality, a mold allows you to make anywhere from a few to thousands of identical parts. A mold is especially valuable for reproducing complex parts, but unfortunately mold construction is an expensive, time consuming process. I will describe the methods and materials I used to build a reasonably inexpensive light-duty mold that is strong enough to build several identical parts.

Molds are expensive. Building a mold is a labor intensive project. First, the part itself, or rather an exact replica of it, must be built (and is often thrown away after the mold is built). This process is called building a master pattern, a.k.a. a "plug." Next, a mold is built over the plug. As you can see, we have built two structures and still do not have a finished part. It makes sense to build a mold only if you need to make several identical, complex parts.

Building a plug and making a rigid mold from it requires spending money on materials that do not go directly into the final product. But the materials in both of these structures can be inexpensive, especially if you need only a few parts. The more parts you need to make, the better mold you will need to make, which means more money spent on materials.

Molds come in two basic forms: male molds, where the final part is built over a convex surface; and female molds, where the final part is built into a concave surface. With a female mold, the inside surface of the mold defines the outside shape and surface quality of the finished part. If the mold is not fair and smooth, the part will not be either.

Building a female mold directly (not building it over a plug) is difficult. The surfaces on a plug are usually convex and are much easier to sand fair, and you have the advantage of seeing what the finished part will look like. The disadvantage of making a female mold over a plug is the expense of building a plug that will be used once and discarded.

A male mold is faster to build and requires no plug, so no materials are waisted. But the finished part is smooth on its inside surface. If you want the outside of each part to look good, you need to fair and finish each one individually. Male molds work well if you are building parts with mostly concave finished surfaces, like fiberglass shower stalls. However, most projects require the good finish on the outside of the part, and this requires a female mold.

The project

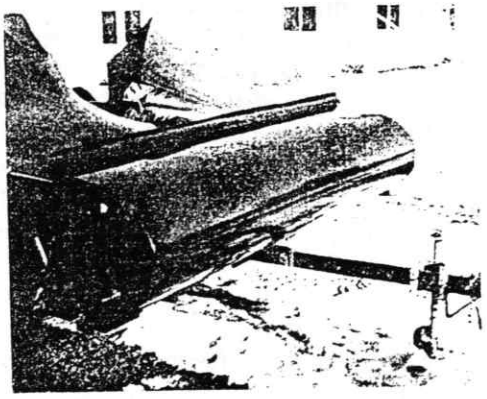
Last winter my son and I decided to fabricate a device to protect our snowmobiles from slush and flying stones when they were being trailered. We could have cut a sheet of plywood and anchored it to the trailer with angle brackets, but that's not in keeping with my philosophy of life which states in part "never do anything the easy way." I decided the guard should have an aerodynamic shape and be very light weight. The realization that I would eventually have to make guards for at least four trailers, convinced me to build our slush guards from a mold.

Deciding whether to build a mold or build each part individually is based on the number of identical parts you need to build, the materials the parts will be made from, and how difficult it would be to build each part seperately. In the case of the slush guards, I decided that while I could build the parts individually, each part would have been heavier than I wanted, and finishing the outside surface of each part would take a prohibitively long time. With a female mold, the outside surface of each part would automatically be as smooth as the surface of the mold. It seemed to me that producing one smooth mold surface would be faster than finishing the surfaces of four individual parts.

Choosing materials and methods

I would start the process by building the master pattern or plug. A plug is constructed to look exactly like the finished part, but can be made of almost any material that is strong enough to temporarily hold together and accept a good finish. In this case, I constructed it from some of the cheapest materials I could find-particle board, 1/4" lauan plywood, and lots of staples and drywall screws.

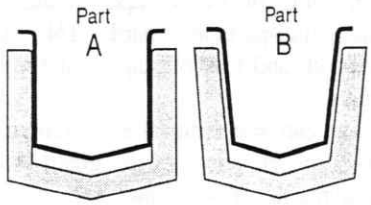
You can see from the accompanying photo that the shape of the guard is fully aerodynamic. You cannot see, however, that the guard is also very light. It has to be removed each time the snowmobiles are loaded or unloaded, so I wanted it to be as light as possible. In order to make the guard light and stiff, I decided to build each part using "cored" construction. Two lightweight fiberglass skins, seperated by a very low density core material - in this case phenolic paper honeycomb - resulted in a guard that weighs only 35 pounds. These materials require the use of a mold. The wet fiberglass cloth and core material have to be pressed against a solid surface and left there until the epoxy solidifies.



Once again, following my philosophy to build everything in the most difficult manner possible, I chose vacuum bagging as the method for clamping materials into the mold. Vacuum pressure forces the wet fiberglass and core material evenly against the mold surface and holds the whole mess there until the epoxy cures.

As you consider the shape of the plug, keep in mind that you are going to build

a mold over its surface and that you have to be able to remove the mold from the plug when you are done (as well as the part from the mold). This means that all vertical surfaces need to be tapered slightly. The top of the plug must be smaller than the bottom. The taper is referred to as "draft", and typically, a minimum 2° slope is used (about 1/4" per foot). As you can see from the diagram, it will be very difficult to remove part A from the mold, while part B will come out easily.



Building the plug

I built the plug as shown in the drawing on the next page. I cut out particle board shapes, or stations, carefully aligned them, fastened them to a sheet of particle board, and stapled wood strips over them. I troweled a putty of epoxy and 407 Low Density Filler over the gaps in the seams. Since the surface quality is important, I applied a layer of fiberglass cloth and epoxy over the wood strips. This gave me a stable surface that I could sand smooth. Notice also the flanges at the perimeter of the plug. These stiffen the open end of the mold and provide a flat surface on which to seal the vacuum bag.

The quality of the plug's final finish determines the quality of the finished part. If the plug surface is fair and smooth, both the mold and the parts will be equally smooth, so I spent a good deal of time finishing the plug's surface. I made a couple of flexible sanding blocks and glued sandpaper to them. I started sanding with 80 grit dry sandpaper and worked my way through the grits, finishing by wet sanding with 600 grit. I filled all pinholes and low spots after the initial 80 grit sanding before continuing with the finer grits. To polish the plug surface, you need to sand at least to 600 grit or you may have trouble getting the mold to release from the surface. Do not skip any grit numbers. 600 grit paper won't remove 80 grit scratches. Any remaining porosity may cause the mold to stick to the plug, so examine the surface carefully before you decide you have completed sanding. Finish the surface by buffing with successively finer grits of rubbing compound.

When I was satisfied with the quality of the plug surface, I began applying a mold release to it. A good mold release needs to fill the porosity that exists on a microscopic level. A good quality automotive paste wax will usually work, but there are also products made specificallv for the job. Expect to apply 4 or 5 coats of wax, buffing between each application.

Building the mold

With the plug thoroughly coated with mold release, I began constructing the mold. I used the materials described below, but depending on the size of the mold and the number of parts you expect to make, you can make the mold heavier or lighter.

I first applied an epoxy "gelcoat" to the waxed plug surface. The gelcoat is made of WEST SYSTEM® Epoxy thickened with 406 Colloidal Silica. The epoxy must be thickened to a ketchup like consistency to prevent it from fish eyeing on the polished surface. After allowing the gelcoat to cure hard, I washed it with water and lightly sanded it. I then applied one layer of 12 ounce fiberglass cloth over the sanded gelcoat with epoxy. If the mold is large like the one I built, use 206 Slow Hardener to allow yourself some working time. Use 205 Fast Hardener if the mold is small or if the shop temperature is cool.

Before the layer of glass cloth cured, I used a notched trowel to spread epoxy thickened with 407 Low-Density Filler over the entire surface. Then I squished 1" thick by 1" wide strips of polystyrene foam into the thickened epoxy. Most of the strips stayed in place in the thickened epoxy by themselves, but some required a little help from duct tape.

When the epoxy holding the foam strips cured, I applied a layer of 6 ounce cloth to the exposed foam surface. I applied a couple of foam and glass supports to provide a flat, stable base for the mold and to help stiffen the entire assembly.

Separating the mold from the plug after the epoxy cured was quite a task. In spite of my efforts to polish and wax the plug surface, the plug and mold stuck together tenaciously. The nearly vertical end surfaces presented too much area to shear loose, and the flange prevented me from deflecting the side of the panel inwards. After much pulling and prying (and gnashing of teeth) I decided the only way I was going to separate the two pieces was to remove the plug piece by piece. So I broke out the particle board stations, which then allowed me to flex the plug surface away from the rigid mold. Slowly the mold released the plug. Do not let anyone tell you that epoxy is not a good adhesive. I know from bitter experience it sometimes sticks where you least expect.

Once the plug was removed (read *destroyed*), I was looking into a polished female mold. But I was afraid to build a part in the mold for fear it would not completely release. I surely did not want to destroy the mold to get one part out of it. So before trying to build a part, I "seasoned" the mold.

If the epoxy in the mold's surface has not cured for a long time, it is a good idea to season it a couple of times before attempting to build a part. Seasoning consists of waxing the mold's surface with 4 or 5 coats of mold release, and applying a gelcoat only with no glass reinforcing, to the mold surface. After it has cured it remains flexible enough that even if it chemically bonds to areas on the surface, you can generally pry it loose or scrape it off.

Building the part

Finally, I felt the mold was ready for building a part. I waxed the surface one more time for good luck. This time I applied a polyester gelcoat. I wanted the shrinkage in the polyester film to help release the part from the mold. But epoxy will not cure if it is applied to partially cured polyester, and it won't stick to the waxy surface of cured polyester. There are two ways to get the epoxy laminate to stick to the backside of the gelcoat film. One is to remove the wax from the cured gelcoat and sand it. The other is to apply a tie coat to the partially cured polyester gelcoat. Tie coat is a film that adheres to both polyester gelcoat and epoxy, and doesn't require extra surface preparation. I used the tie coat. I applied the gelcoat to the mold surface, allowed it to cure for an hour, applied the tie coat and allowed everything to cure overnight.

Laminating of the actual part required several steps, all of which had to be

accomplished before the epoxy cured too hard to clamp. I needed several hours of open time to accomplish the lay-up, so I selected 105 Resin and the 209 Extra low Hardener. The 209 Hardener gave me about 5 hours of working time at 65°F, my shop temperature.

Since the outside of the slush guard takes a lot of abuse, I used our heaviest fiberglass cloth, 738 Biaxial Fabric with mat, 22 ounces of biaxial fabric and chopped strand mat all stitched together. I chose 1" honeycomb for the core material. For the inside skin, which doesn't receive much abuse, I used 6 ounce glass cloth. I reinforced the ends of the part with 3/4" plywood instead of honeycomb because I needed to install some mounting hardware and felt the honeycomb core didn't provide enough strength.

I applied one layer of the 22 ounce cloth to the gelcoat/tie coat surface using 105/209 mixture. When the cloth was wet-out, I pressed it into place with a squeegee. I did not spend a lot of time doing this because later the vacuum pressure would press out any air bubbles. I applied several layers of fiberglass tape reinforce all corners and flanges. Then made a "core bonding putty" by adding 407 Low-Density Filler to the 105/209 epoxy and applied it to the wet-out cloth with a notched trowel. I pressed the pre-fit honeycomb core material into the putty, along with some solid wood blocking where the hardware attached. Next I rigged the vacuum bag and applied enough vacuum pressure to firmly press the glass cloth and the core against the gelcoat surface.

When the epoxy cured hard, I shut off the vacuum pump and removed the vacuum bagging materials. Finally, I applied 6 ounce glass cloth to the inside of the core material.

Removal of the part from the mold went much easier this time. The polyester gelcoat shrank as expected, releasing it from the mold. All that was necessary to pop the part loose was a little strategic prying with wooden wedges.

The second part I built from the same mold had a different finish. I wanted to paint the guard the same color as the towing vehicle, so instead of using gelcoat, I sprayed a paint primer in the mold and laminated the same cloth/core schedule as above.

To be sure the primer released from the mold, I used PVA (polyvinyl alcohol) on the mold surface. PVA is a liquid that can be brushed or sprayed on the surface of the plug. It is easily dissolved in water, so you can wash it off the finished mold surface. No solvents or sanding are necessary to remove the residue. The PVA surface lacks the smoothness of a polished wax surface. But I was not too concerned about the surface quality of the part, because I knew I would have to sand the primer before I could apply the final paint job. Since I used paint primer, I did not need to use a tie coat. I simply let the primer dry on the mold surface, sanded it lightly, and applied the glass/core/ vacuum bag as described above.

Last year my son and I built two slush guards. This year we hope to build two more. The mold should hold up for a few more parts before it starts to deteriorate from the abuse it takes whenever a part is released.

Sources:

Polyester/epoxy tie coat:
Duratec Bond Cote®
Hawkeye Industries (404)-977-3336
3050 Brookview Drive
Marrietta, GA 30067

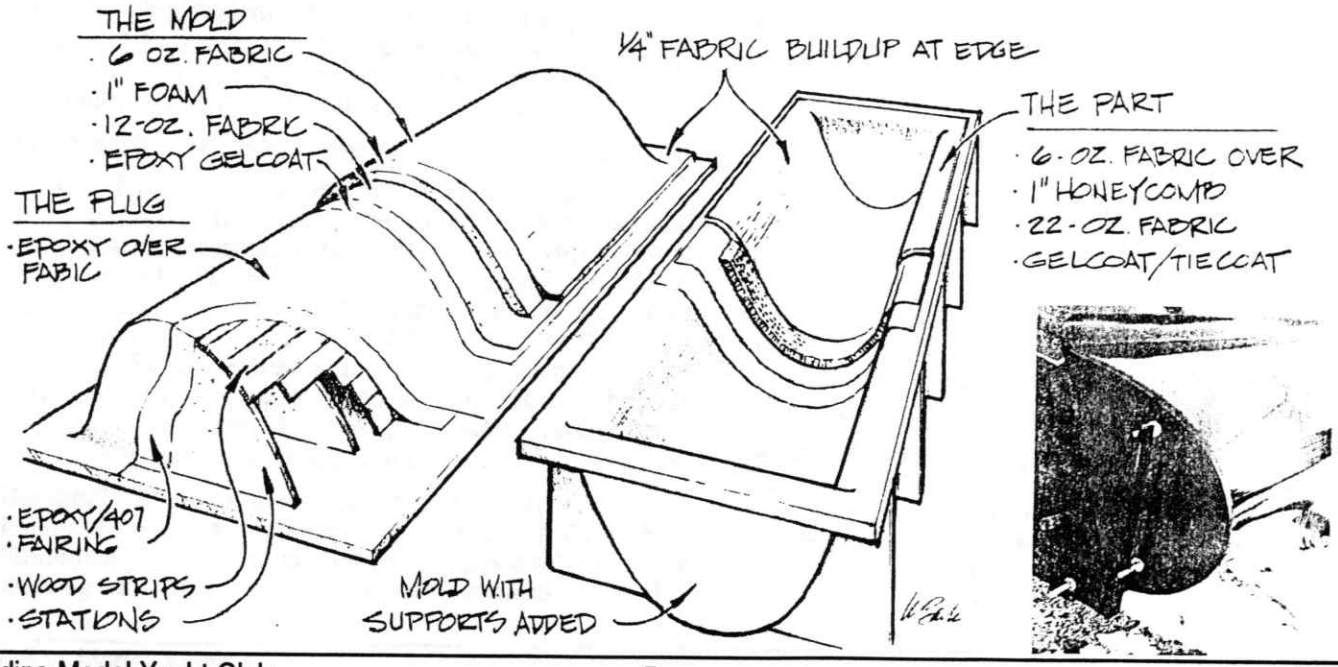
Gel-Coat Products (206)-781-1162
1109 NW 52nd St.
Seattle, WA 98107

Mold release:
PVA
Defender Industries (914)-632-3001
Box 820
New Rochelle, NY 10801-0820

Blue Max
Finish Care (818)-443-8983
1726 Floradale Ave.
South El Monte, CA 91733

Meguiars Mirror Glaze
Irvine Industrial Complex
Irvine, CA 92664

Epoxy:
West System®
Gougeon Brothers, Inc. (517)-684-7286
P.O. Box 908
Bay City, MI 48707



April Meeting Notice:

(Third Tuesday of the Month)

Tuesday, Apr. 15th

7:00 P.M.

Centennial Lakes

Centrum Building

Commodore:	Dan Proulx
Vice Commodore	Dave Bros
Vice Commodore	Doug Campbell
Vice Commodore	George Pfeifer
Vice Commodore	Joe Hjelmstad
Treasurer	Gary Phillips
Newsletter Editor	Jim Smith

[redacted]

EDINA MODEL YACHT CLUB
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First Class