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Designing for Series Production must include not only factors pertaining to the shape and form of the boat but must also consider facilities, production techniques, and marketing.

One might question the role of marketing in a discussion of this nature. Stated in simpler terms, if you do not have a viable product to sell, there will not be any production. The determination of what the marketplaces want and in what potential quantities is vital to the production builder.

The Marketing Plan
All too frequently the approach to a new design starts with 98% enthusiasm and 2% knowledge of what the market really wants. The result is often a large expenditure... Continued on page 4

Deck being installed on an Island Packet sailboat
It was a good to have an IBEX back in Florida. The Tampa venue worked out beautifully, with attendance and exhibitors both up from 2013. The Westlawn booth was busy as usual, with many students, alumni, Westlawn friends and prospective students stopping by.

Westlawn director, Dave Gerr, presented a seminar on the efficient powerboat, which was well attended. The seminars overall, were rated highly by IBEX attendees.

Westlawn was presented an award for being one of the organizations that has advertised in Professional Boatbuilder magazine continuously, from the day ProBoat was founded.

The official Westlawn student dinner was on Wednesday evening, at the famous Columbia Restaurant, in Ybor City. Over traditional spanish food, students and alumni connected and discussed a wide range of subjects.

As usual, students has such a good time that they actually met for dinner all three days of the show. These two additional informal dinners were hosted by Westlawn student and marine surveyor Ray Toth and his wife Toby, with help from their young son, Sam. A combination of tall tales, deep and serious design discussions and an assortment of jokes (good and bad) made these dinners to remember. Many thanks to Ray, Toby and Sam for their hospitality.

IBEX has consistently proven to be THE show to attend to learn about boats on a professional level. The combination of seminars, gear, equipment, hardware, boatbuilding materials, and much more, and the ability to exchange ideas with other students and established marine professionals has proven to be invaluable.

We’ll see you at IBEX 2015, in Louisville, Kentucky.
Final Fiscal Year 2014 collection numbers for The Sport Fish Restoration and Boating Trust Fund (SFRBTF) are in and the news is good; receipts are up 4.9% over FY 2013 numbers for a total of $624.9 million. The lion share of this increase comes from $328 million paid by boaters at the pump. SFRBTF serves as the backbone for conservation funding in the United States. It serves as the critical funding pool for vital state and national recreational fishing and boating programs, including recreational boating safety programs; fisheries management; habitat conservation; vessel pump-out stations; water and boating access infrastructure programs; and aquatic resource education programs; among others. Funding for the Trust Fund is attained through a “user pay” system. Taxes on fishing tackle equipment, motorboat fuel, imported boats, and small engines are pooled together to create this fund. In turn, the funds are then allocated to federal and state programs for wetlands conservation, sport fish restoration, boating safety, boating access and facilities projects, and aquatic education and outreach.

The bipartisan Trust Fund has existed for nearly 60 years providing vital federal aid in a cooperative effort between federal and state agencies, boaters and anglers, and has consistently been reauthorized and strengthened by Congress. Since its creation, the Trust Fund has been refined and expanded by Congress. It is unquestionably the most valuable federal legislation for anglers and fishery resources and boaters, delivering hundreds of millions of dollars each year to state fishing and boating programs. The Trust Fund provides the core funding for each state’s sport fish restoration and boating safety and education programs. SFRBTF is again up for reauthorization as part of a 2015 Highway Bill. As part of that reauthorization, NMMA and its coalition partners in the Angling & Boating Alliance support the reauthorization the Sport Fish Restoration & Boating Trust Fund.

Westlawn Online Library Adds Translation Aids

Now at nearly 200 items of reference material, Westlawn’s online library has added much new material. Indeed, two complete new sections have been added:

B) Nautical Glossaries: B1) Dictionaries and B2) Translation Aids

and

L) Accident Investigation, Forensics, and Reconstruction

Students for whom English is their second language will find the new English-to-other-language glossaries very helpful. There are nautical glossaries for:

- Chinese
- French
- German
- Italian
- Japanese
- Portuguese
- Spanish

Funding up nearly 5% for Sport Fish Restoration and Boating Trust Fund

NMMA
Design For Series Production Continued from page 1

ture for the resources to produce the product followed by a short production run followed by the bill collectors and eventually liquidation of the assets at a fraction of their original price.

Why does this happen? Although the marketplace is broad it should be viewed as being made up of a series of bands. Each of these bands represents market segments composed of potential buyers with somewhat similar likes and dislikes. Between the bands are voids or hollows composed of a small number of buyers each with diverse interests. To avoid the low population diverse groups, production oriented builders must study their markets in sufficient detail to determine those parameters that fit the market segment of interest.

To arrive at this position business must develop some sort of marketing plan.

It is perhaps one of the most important aspects of a business and correctly done will provide a sound foundation for long-term business development.

What is the Marketing Plan? In simple terms, this plan is a statement of the tactics and strategy (the program) that must be used to reach the goals and objectives of the company. The goals and objectives come from an analysis of the problems and opportunities facing the company, which in turn is based on a statement of facts. The simple framework of a plan is, therefore, (1) facts, (2) problems and opportunities, (3) the objectives, (4) the program. With this kind of framework many types of plans can be developed such as sales promotion, advertising, research, and product development.

It is the intent here to provide a brief outline which if followed will assist in the development of a marketing plan. For more detailed accounts of this procedure, the reader should consult some of the excellent texts specifically on this subject.

The first element of the marketing plan is the determination of the facts. This is sometimes stated as situation analysis. The list below is one example often used in making up this analysis. In essence, it is sort of a checklist by which a given business entity can evaluate their position relative to their competitors and the market in general. The use of a single matrix comparing your company's policies and products with your major competitors can be one of the more enlightening methods employed in the fact finding analysis. This comparison is commonly referred to as the marketing mix.

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<tr>
<th>MARKETING MIX</th>
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<tr>
<td>Your Company</td>
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<td>Promotion, Sales Aids</td>
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<td>Personal Selling at Retail</td>
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**THE FACTS** (Situation Analysis)
Let's take a picture of the business and our business as it stands right now.

A. Size, scope and share of market
   1. Sales history of competition and their market share in dollars and/or units.
   2. Market potential and major trends in supply and demand for this product and related products.
   3. Pricing history through all levels of distribution, reasons for fluctuations.

B. Sales, costs, profits of company's products
   1. Sales history, by size, model, geographic areas
Design For Series Production Continued

2. Cost history, materials, labor, O/H selling, advertising, G&A, R&D
3. Profits (net before taxes) including competitors if known

C. Distribution Channels
1. Identification of principal channels, sales history through each type, including competitors if known.
2. Buying habits and attitudes of principal channels, inventory policy, turnover, profitability.
3. Pricing policies vs. competitors’
4. Promotion, advertising, point of purchase aids vs. competitors’

D. Product Comparisons
1. Overall strengths and weaknesses
2. Price comparison with competition
3. Breadth of line vs. competition

E. Consumer or end user
1. Identification of potential buyer, age groups, sex, income levels, education, occupation, geographic locations.
2. Consumer attitudes or the firm's product vs. competition on quality, price, styling, performance, packaging.
3. Consumer purchase habits, time of purchase, place, cash, credit, frequency, etc.
4. Consumer use habits - how, where, when by whom

What is Important from this analysis is not the facts as facts, but the knowledge and understanding they provide when viewed and interpreted in perspective. This can be broken down into four broad areas:

1. Facts about the Product - We must define what the product is physically, what it is designed to do, how it works, comparisons physically and functionally with the competition, sized, priced, etc., and what trends and developments are taking place that could affect our product and the competition.

2. The Market - We need to gather as much insight and facts about the people to whom we intend to sell our boats. This might start by analyzing the distributor channels through which our boats reach the public. The buying habits and attitudes of dealers, distributors on whom we must rely.

The main emphasis is the consumer. How many? Who are they? Where are they? What is our share of market? What is our competitor's share? Are they gaining or losing share? Are we gaining or losing? Study the current customers, their number, locations, how they use the product. Be concerned with age groups, income levels, education. Find out as much as you can about the buyer, how he uses the boat. We must always remember the marketplace is constantly changing.

3. Attitudes and Motivations - In house or independent surveys can often help gather this type of information. Discussions with current customers at shows, at the plant, and boating functions is also helpful. It should provide answers to questions like:

   a. The interaction between the buyer and the boat.
   b. How important do they view the need for our boats.
   c. How they perceive its benefits vs. competition models.
   d. Their satisfactions, dissatisfactions, brand loyalties for our boats and
Design For Series Production Continued

e. What trends and developments in brand reputations and images and what impact this has had on consumer attitudes.

4. Competition's Terrain - What are they claiming, with what weight, and through what media? What are their strategies and tactics? Do they have the capability of countering our changes in prices, policies, product, etc.? How have they positioned their product, expensive, low priced, race or cruise oriented, high quality, low quality?

With an understanding of our product, our market, the customer, and the competitor's environment, the problems and opportunities confronting the business can be defined and thus a marketing objective established.

DESIGN

With the introduction of fiberglass reinforced plastic (FRP) after World War II as a commercially feasible boatbuilding material, many designers and builders believed that design and construction restrictions imposed by traditional materials would now be eliminated.

Years of experience with wood, steel, and aluminum had produced well-defined limitations for practical, economically sound design and construction techniques. However, these limitations sometimes had an influence on the design from cost or availability considerations.

For example, with some metal boats, developable section forms were chosen over designs having compound curvature in the interest of cost. The width of the keel on a wooden yacht has in the past been controlled by the timber size available.

FRP sometimes referred to as the "miracle material" was erroneously portrayed as being devoid of any such limitations. It certainly opened up many new areas for design expression utilizing shapes and forms heretofore considered impractical.

As the marine industry gained experience with FRP some very well defined problem areas became apparent. In general terms, the designer should avoid:

1. Large Flat Panels - The highly reflective nature of gelcoated FRP laminates will accentuate even the smallest imperfections or distortions. During the curing process FRP flat panels tend to distort and with repeated usage the mold surface from which the part is made exhibits a similar change. The combined effect, distorted mold and part, often produces cosmetically an unsightly part.

2. Deep Narrow Appendages - The normal construction sequence for FRP boats utilizes female molds*. Thus, in effect, the boat is built from the outside (gel-coated surface) to the inner surface (last layer of FRP).

Starting from the gelcoat, each reinforcing layer of glass and resin is applied and laminated to the adjacent surface using 8 variety of hand tool applications*. For parts that are deep and narrow the process becomes increasingly difficult as working space becomes smaller with each successive lamination. The ability to control the amount of resin retained in deep narrow pockets is difficult. Sometimes due to drainage or over application, the resin puddles producing a resin rich laminate. Also, during the curing process excessive...
heat is generated causing laminate and gelcoat distortions. The opposite situation can also exist, i.e. lack of sufficient resin will result in a dry laminate. Both of these conditions produce inferior lay-ups exhibiting physical properties that are less than ideal and with dry laminate the additional possibility of leaks exist.

Laminate glass content is the basic parameter to be used in evaluating the layup. The relationship between laminate properties and glass content is well established and glass content data is readily obtained from samples in the average shop.

The designer should keep in mind that the strength of a laminate and its stiffness is dependent on glass content and any slight variation in the resin to glass relationship will affect these values.

Generally, decreasing glass content reduces the mechanical properties but thickness per ply increases resulting in greater inertia, area, and section modulus. Thus, to some degree, these two factors tend to offset one another.

However, this is only true within defined limits that are well documented by the fiberglass industry.*

Deep pockets also present problems to the fabricator in terms of obtaining a sound laminate, one devoid of air pockets or voids. Should they exist, leaks are possible and the reduced section can produce higher stress levels (stress raises) with the probability of laminate failure (Figure 1).

To eliminate or reduce these problems, the designer should consider the alternatives available in lieu of deep narrow sections. Outside ballast instead of inside is one solution, for example (Figure 2).

3. Split Molds, Inserts - Many of the fine details obtainable with FRP laminates are only possible utilizing split molds or inserts. Such details as cove stripes, recessed windows normally require molds made up of several sub molds.

During the lamination process the gelcoat flows into the joints between the mating surfaces which then appears as a flashing or small flange on the finished part. Often this flashing is cosmetically unacceptable and must be removed by grinding, sanding, buffing, and finally polishing. The polishing attempts to blend the joint into the overall finish and depending upon the care exercised will accomplish this objective with varying degrees of success.

Through repeated use, the joints between mold surfaces tend to break down making the flashing areas larger and more difficult to finish. Patching of the finished part is often required with its inherent problem of color matching.

* Ref: Scott, Fiberglass Boat Design and Construction

Frequently a good match appears in the shop but exposure to the elements on the water will frequently in time present a different picture and one that is unsightly.

If split molds or inserts are required the designer should attempt to limit the number and extent of joints requiring post finishing. Many times the joint can be covered with a flange (window) or trim piece (rubrail, guard, etc.) (Figure 3).

4. Sharp Corners, Tight Radius - Sharp corners, very tight radius (less than 3/8") produce many of the problems associated with deep pocket laminations. In addition the reinforcing laminates behind the gelcoat will often pull away
Design For Series Production Continued

from the surface causing voids or air bubbles.

This type of problem is frequently associated with deck details such as bosses around hatches, coamings, the intersection between cabin trunk sides and tops, etc. (Figure 4). The designer often needs to seriously consider the fabricator’s problems and temper pure asthenic objectives with practical boatbuilding requirements.

PRODUCTION TECHNIQUES
The phenomenal growth in recreational boating during the post-war period can be tied directly to the development of FRP as a boatbuilding material. Fiberglass construction techniques made possible the high rate of production output so necessary to satisfy expanding market demands. The methods of fabrication using FRP resulted in substantial cost savings for labor and material through production economics, putting boating within the reach of millions of people. The final product has relatively low maintenance and upkeep; a key factor in our busy society.

During the early stages of development builders concentrated on the ease of fabrication that FRP provided for hull and deck components. The potential economies were obvious from the start. However, the installation of interior components, electrical systems, machinery, plumbing, etc., followed traditional methods. In essence, although the fabrication of hulls and decks entered the new era, the rest of the assembly, in many instances, followed time honored methods mainly developed from custom fabricators.

A few examples will illustrate some of the advances in these areas.

Interior Fabrication - The early FRP boats utilized molded
components for hulls and decks. The interiors were built piece by piece inside the hull, not unlike custom methods that have been employed for years.

Today, most manufacturers cut component pieces in quantity from accurate templates, sub assemble the parts into various interior components such as galley units, lockers, berths, heads, and then bring these sub-assemblies together on a master jig. The interior is basically completed on this master jig and then lifted as a unit into its hull on the assembly line where it is attached to the hull usually by bonding bulkheads, partitions, etc., with FRP lay-ups.

The master jig properly designed will locate accurately each interior component insuring proper fit of the final assembly to the hull and deck. Many builders utilize FRP pans on which the wood components making up the interior are assembled. The FRP pan becomes the locating jig and cabin sole. (Figure 5)

Electrical System - In the past, using schematic wiring diagrams as a guide, electricians armed with coils of multi-colored wiring went aboard the partially completed boat and strung their wiring. A laborious task at best considering the many obstacles in the form of interior joinery the electrician had to cope with.

The more advanced systems of today utilize a wiring harness that is pre-assembled on a board on which the various wiring circuits are laid out full size. These pre-assembled harnesses are then installed on the interior unit while it is under construction on the master jig. Installing the wiring at this stage permits working on the unit from the outside as opposed to running it inside the boat which has reduced the labor hours considerably and improved the overall quality of the workmanship. It is important, however, to consider access to connectors once the interior unit is placed inside the hull. This is sometimes overlooked in the interest of efficiency at the plant level. The service yard or owner is not appreciative of this approach. Testing of the electrical system is also possible during the sub assembly stage and faults easily found and corrected.
Design For Series Production Continued

In some installations by using bayonet type connectors the final electrical hook up on the finished boat amounts to simply joining the male/female components. This type of installation is commonly supplied on many of the main engines used today and has contributed substantially to improved installation productivity and reliability of the engine’s electrical system.

Plumbing Systems - Plumbing systems not unlike their electrical counterparts have their own circuits. The advanced production techniques employ pre-assembled plumbing trees, in whole or in part to be later joined into the complete network.

Subassembly installation outside of the hull has proven to be most efficient. In some installations plumbing lines are attached to the underside of cabin soles while they are upside down before they are located on the building jigs. Testing of a major portion of the plumbing system can be done on the shop floor, leaks readily found and corrected with a minimum expenditure of time and effort.

Again, it must be emphasized that accessibility to the various plumbing components in the finished product is critical and should be checked by a quality control inspector by actually trying to service the fittings.

The sub assembly examples given here also apply to many other components and systems that make up the complete boat. Where optional items such as air conditioning, refrigeration, heating, etc., are offered to the buyer, the builder should determine the most efficient installation sequence to minimize his costs and thus increase his competitiveness in the open market.

Standardization - The production shop must be concerned with the high cost of carrying shelf inventory and loss of possible production space for excess inventory requirements.

As the company’s product line expands the requirement for various components going into the boat also increases putting serious demands on warehousing space and cash flow. To offset this a diligent effort must be extended with every design to make use of existing fittings, equipment, and components.

For an example of the latter, when laying out interior joiner work, existing drawers, door flaps, etc., can often be used in a new design by making minor dimensional changes to the new layout.

The production shop that ignores the accrued benefits derived from standardization is ignoring a real profit opportunity.

Facilities
Early FRP production building often took place in existing facilities, converted mills, warehouses, lofts, etc. Seldom did you find the builder starting with a new plant specifically designed for production orientation.

The conversion of existing plants to FRP boat production was in most instances far from ideal. Workflow and material handling was often encumbered by plant structure that could not be arranged. The low costs associated with labor and material of the 50's and 60's made this approach to production tolerable. Some of the more progressive builders, however, were quick to realize the advantage they could gain over competition by having an efficient plant layout.
By approaching the problem from scratch, new facilities specifically designed for high-volume boat production emerged revolutionizing the boatbuilding industry. There followed high rates of daily production, output unheard of before. Today, there are many outstanding examples of plant layout for series production. Although each plant differs from the other in specific detail, they show generally a common flow pattern. This is illustrated in Figure 6.

The main stem of this system is the assembly line. After the hull and deck component are molded, they proceed through a series of workstations starting with, for example, the bare hull received from the mold room and finishing up with the completed product. The actual number of stations will vary from a few, 6 to 8 for smaller boats, to about 20 plus for larger more complex boats.

Material from the warehouse and sub shops is issued to the proper station in the proper building sequence.

It becomes readily apparent that the success or failure of this approach to boatbuilding is highly dependent upon several key factors.

a. Material is on hand
b. Trained people available
c. Sub shops complete their work on time
d. Work flow is uninterrupted

The designers and engineers can affect all of these areas thru their selection of materials, equipment, and the approach taken to component design. In effect, they do influence by their judgments the profitability of the company. It is, therefore, important when considering the selection of designer/engineers either as consultants or as in house staff to look beyond the pretty pictures. How capable are they in practical matters of construction, and how dedicated are they to the preservation of profits, yours?

As technology advances, so must the state of the boatbuilding art. This means that all aspects of production boatbuilding must respond to the new systems, methods and materials, and evaluate them in light of economic feasibility, availability, and quality. The builder who hangs on to the old outdated method may find himself hanging on.

In summary, the successful modern boat manufacturing organization employs disciplines found in many other sound business ventures. What they intend to build is the output of a market study as opposed to satisfying the whims of a select few.

The design is developed with production orientation foremost in mind. They purposely avoid configurations and details that would prove costly and troublesome at high rates of production. They employ production techniques developed to minimize labor and material costs and manufacture their products in efficient facilities specifically designed to build boats. Boatbuilding at these levels has moved into the serious business category, and therefore, offers many opportunities to the qualified person seeking a career in this industry.
William H. (Bill) Shaw

Westlawn graduate Bill Shaw wrote this article on designing for series production for Westlawn at the height of his career as the head designer for Pearson Yachts, one of the most successful production sailboat builders in U.S. history. — Ed

William H. (Bill) Shaw is a Westlawn graduate and a graduate of the U.S. Merchant Marine Academy, having served in the Navy in World War II as a cadet midshipman. He was chief designer for Pearson Yachts, one of America’s largest sailboat manufacturers.

Before joining Pearson in 1964, he worked as a designer under Olin Stephens at Sparkman & Stephens in New York. After his time at Sparkman & Stephens, Shaw created or oversaw more than 40 sailboat and powerboat designs, as well as canoes.

Shaw was also the co-founder of the Midget Ocean Racing Club, which was sparked by his Shaw 24 design. “When he got to Pearson, he just carried his design philosophy forward. When you think of how many Pearson boats are out there, my God. He worked hard to make sure that sailboats didn’t become stripped-down machines with popsicle sticks hanging down the bottom of them.”

Shaw’s designs were “conservative and above-all safe,” says Tom Hazelhurst, whose company marketed Pearson boats and who became Shaw’s friend on and off the water. “He was not one to reach out to the edges of design. I don’t think Bill would take a chance with a life or a boat or [would] design anything that was marginal.”

As a result, today’s Pearson owners are devoted to the brand, says William Lawrence, who heads the Pearson Yacht Owners Association. That devotion “came from the fact that he designed a very safe, sound, robust boat” that was “always reasonably priced and always well-made,” says Lawrence.

Shaw departed us on his final sail, in 2006.
How We Learned To Skim In Steps
Development of the Stepped Hydroplane
By Dave Gerr, CEng FRINA, © 2014 by Dave Gerr

Now, about the design dope; where does a fellow begin when he starts out to design a hydroplane?

Naval Architect, E. Weston Farmer

Last issue, we examined the development of something we all take for granted these days—planing. Newfangled gas engines provided the spark, which—quite literally—permitted planing (flying too, it was no accident that the Wright brothers' success was at this time). Steam engines—even sophisticated double-action, multiple-expansion, compound machines—had simply been too heavy for the power they produced. Their sheer mass couldn't generate the zip required for high-speed excitement.

Now, with gasoline machines, all that was left was to find the proper form of lightweight hull to mate with these newfangled featherweight powerplants and we'd be set. From 1905 on, things were really cooking: model tests, experiments, false starts, races and more races, and inexorably rapid progress. Indeed, the conventional planing runabout, as we saw last issue, was being mass produced just a few short years later—by 1909.

Stepping Off
So far, however, we've only covered half the story. In fact—besides the right Reverend Ramus, who we discussed last issue—there was yet another inventor that would influence planing boat development—William Henry Fauber. Fauber took out no less than nine patents on an all-new approach to planing, the principle ones being in 1908 and 1909.

Fauber reasoned that, since a boat skimmed (planed or generated lift) by striking the onrushing water at a slight angle, adding more of these angles would generate more lift. His angles were in the form of multiple jogs or steps in the bottom of the hull. What's more, while the boat was supposedly skimming along on these numerous steps, only their very tips would be touching the waves. The remainder of the hull underbody would be in contact with air and foam alone. Since everybody knows that air (and foam) are less dense than water, resistance should decrease dramatically.

What's particularly nice about all this, is that—broadly speaking—Fauber was right. In fact, just a year later (1910), a multi-step hydro competed in the British International Trophy. (Powerboat racing was hot, hot, hot back then—it was all new.) According to the September, 1910 Rudder magazine:

"Dixie III [the U.S. defender] got the honors but Pioneer, a Fauber hydroplane,

Maple Leaf IV at speed. Look closely at the waterline to see some of her multiple steps.

Photo: The Consuta Trust, www.consuta.org.uk
showed by far the greatest speed possibilities."

The only reason *Pioneer* didn’t win every race by a huge margin was repeated gear failure.

**Maple Leaf IV**

In 1912, S.E. Saunders (the designer and builder of *Ursula*, see last issue) knocked together a little 40-footer. A multi-step hydroplane named *Maple Leaf IV*. She was also based very closely on Fauber’s multi-step patents, and she did 55 knots with a single 800-hp engine—a 157-percent increase in speed over *Ursula* in just 4 years, and that with nearly the same power! Indeed, by coincidence, both *Maple Leaf* and *Ursula* weighed in at exactly the same 5.25 tons.

*Maple Leaf IV* succeeded where *Pioneer* fell short; she took back and successfully defended the British International Trophy (the Harmsworth Trophy) twice! She was also the first boat in history to exceed 50 knots. If you have any doubts about *Maple Leaf*’s effectiveness, ask yourself how many 40-footers you know that can sustain an honest 55 knots (63 mph) today? I doubt you can think of many. I’d be surprised indeed if you can think of any this size that can make this sort of speed with a mere 800 horsepower.

**A Thorny Boat**

Meanwhile, back in 1877, a fellow named John I. Thornycroft (Sir John Thornycroft, to be precise) was experimenting with the new-fangled Ramus effect, using models he towed along at the end of a fishing rod. He had some limited success, but—as we’ve seen—the power wasn’t there and he appeared to abandon this skimming madness, going on to build the “sensible” ultra-narrow torpedo boats of the day. (By the way, Thornycroft—later Vosper Thornycroft—was to become one of the greatest builders of planing boats—pleasure, commercial, and military—for the next 75 years. Sadly, last time I was in Portsmouth, England, the plant was shut down.)

As we all know, however, once a crazy idea gets into some inventor’s head, it just doesn’t get out again. (Maybe someone should start and organize: Inventors Anonymous? The Gadgeteers Recovery Society?) Anyway, Thornycroft was no exception, and—as engine power increased—he returned to the skimming thing in a big way. In the space of a few short years, around 1906 and ‘07, he built his own model-testing tank and ran experiments on well over a dozen different models. Of course, back then, nobody knew for sure what a planing boat should look like. The models had every imaginable shape. Some were no more than neatly rounded bricks or shingles, others were like canoes with wings on the bow, and still others were similar to modern planing hulls.

**Miranda III Does The Bounce**

Thornycroft came to the conclusion that a single step amidships would be just as efficient as Fauber’s multitude. After satisfying himself about his results, he built himself *Miranda III*. She was a single-stepped hydro with—I don’t know what else to call it—a “wing” mounted on a strut, projecting down from her bow into the water. The purpose of this wing-on’a-strut was to lift the bow so the boat would ride at an up-angle on it and on her after planing steps. (On “single”-stepped hydros, The transom itself acts as a second step or planing surface.)
Miranda III actually made fairly good speed in smooth water. Her problem was the confounded wing-on-a-strut thing. (It’s easy to be scoff about it now but, in those pioneering days, who knew what would work?) In any case, the slightest wave action caused poor Miranda III to bounce up and down spectacularly and virtually out of control. What would any inventor do? Yep, back to the drawing board.

Miranda IV Does It Right
Thornycroft’s next effort hit the mark dead on. His Miranda IV was a true modern single-stepped hydroplane (remembering that the transom actually acted as a second step or planing surface, but isn’t counted in the conventional naming system.) She had hard chines, and was 26 feet LOA by 6 foot beam. Powered by a single 120-hp engine, she clocked in at 35 knots—a speed-length ratio of 7. Sir John’s new boat is speced as weighing 22 cwt., in racing trim. What is a “cwt.”? Good question; nothing like the old English measurement system?! A cwt. is a hundredweight, which in England is equal to 112 pounds (it’s probably best not to ask why). At any rate, Miranda IV was 2,460 pounds, or at 20.5 pounds per horsepower she was doing 35 knots. This is good going even by modern standards.

Miranda Meets Parliament
In 1910 this sort of speed (on so small or so short a vessel) was unheard of. Indeed, Miranda IV’s made quite a sensation on a run down the Thames past the Houses of Parliament. It was tea time—what else—on the verandahs overlooking the river. As Miranda IV shot by, eating stopped and all heads swiveled to take in the approaching missile. Sir John eased her off and pulled along side the shore to hobnob with a few
friends (handy to be a knight at times like this). Then, he headed her out, gooseing the throttle and leaving little behind but foam.

... and Takes a Photographer for a Ride

Some weeks later, a passing photographer asked for a ride on *Miranda IV*. Thornycroft, was always willing to give demonstrations. He offered the fellow a seat (really “a stand,” I suppose) in the foredeck hatch, and *Miranda*’s engineer recalled the trip:

“We found it quite bumpy enough aft, for it was really rough, but forward it was very much worse apparently. The first bump shot our friend up through the hatchway till his knees were visible above the coaming, and at the second he disappeared with a crash, camera and all into the bilge. From a spectator’s point of view it was really very funny, though I doubt if the victim thought it so.”

To be fair, Thornycroft and crew hadn’t considered the extreme motion at the bow. They were-

A 55-foot CMB on patrol

n’t playing a nasty trick; everything was so new they simply hadn’t thought it through.

Getting the Water Out

Thornycroft’s experimenting wasn’t limited to the major breakthroughs, however. His engineer went on to relate:

“The bump that had taken the photographer into the bilge had apparently landed him against a plug placed up forward which had become dislodged, letting in a stream of water, ... Our passenger by this time was somewhat scared, for which I did not blame him, and I really think he imagined himself at the mercy of two lu-
natics, when we proceeded to cheerfully pull out another plug about 2 in. in diameter in the stern “to let the water out,” as we explained to him. As a matter of fact, it did run out very nicely, because the plug in question was just aft of the step where, of course, there was a good deal of suction, so that the boat emptied herself at once. “And you might make note of the careful way we design these things,” said Mr. Thornycroft. “The hole forward is about an inch diameter and this one much bigger, so the water will always run out faster than it comes in.” The explanation I am afraid, only partially satisfied the photographer.

Yes, Thornycroft seems to have invented the suction bailer. Before planing speeds, if you opened a hole anywhere in the bottom of any boat, water always came in, it never ran out. No wonder the poor photographer thought Miranda IV’s crew was mad.

The Best Planing Boats?
Stepped hydroplanes, it turned out, were and still are more efficient pound-for-pound than conventional planing hulls. Given two hulls of similar overall proportions and weight, the stepped boat will be significantly faster. A 9,000-pound stepped hull, for example, would do about 34 knots with a 250-hp powerplant, while a 9,000-pound conventional planing hull would reach a bare 25 knots, with the same 250 hp—a 36 percent difference! It was because of this that the British Admiralty chose stepped hulls for their Costal Motor Boats (CMBs), during World War I.

Steps to War
CMBs were built principally in two sizes 40 feet and 55 feet. Largely forgotten today, they proved themselves in the English Channel, and the North Sea (not areas noted for calm). All the CMBs were designed and most (if not all) were built by none other than Sir John Thornycroft. They were almost perfect enlargements of the original 26-foot Miranda IV, with—naturally—a few tweakings and refinements, plus the adjustments necessary to carry armament. The 55 footer was 11 foot beam, displaced 14 tons, and did 46 knots with 1,200 horsepower. At the end of the War to End All Wars, some of the British CMBs were sold to Russia, where they were fitted with extra machine guns, and were used in river patrols during the end of the Russian Revolution.

A peculiar thing about the CMBs: Most of them weren’t fitted with mufflers. The reason? The noise was supposed to mislead the enemy into thinking they were under attack by airplanes!? Well, the CMBs served well; maybe it worked? We do know—from examining German ship’s logs—that during several night attacks the German seamen mistook CMBs for submarines, even after getting the boats dead in their searchlights.

Where are the Stepped Hydros?
Of course, you might well ask: “If stepped hydros are so good, why aren’t we surrounded with
them?" The answer's a bit complex. At the start of the Second World War, most of the world’s navies considered stepped hulls for their patrol boats (even the U.S.). Good as their speed is in proper trim, however, it turns out that stepped hydros are equally bad if they’re out of trim. (This had been an on-and-off problem with the WWI CMBs.) When a small boat’s carrying a couple of torpedoes weighing two tons apiece, it’s an understatement to say that trim tends to change after firing. Performance and handling suffers as a result.

Now, back in the nineteen-teens, light powerful engines were hard to come by. As a result, the out-of trim difficulties were put up with to get more speed with the limited power available. In the late 1930s, though, bigger engines were in production, so most navies decided to avoid the out-of trim problems, sticking with conventional non-stepped planing hulls. Italy was the major exception. They had several models of double-stepped hydros (two steps amidships plus a third, not counted—the transom). Their 61-foot by 15-foot 4-inch MAS 500 series proved quite able, doing 43 knots, on 28 tons displacement, with 2,300 hp. This was with crew, two torpedoes and six depth charges.

Considering that the MAS 500s were almost 160 percent heavier than the CMBs had been, they were going great guns. What’s more—as had the CMBs—the MAS 500s proved relatively good sea boats. Our own U.S., 77-foot, WWII Elco PT boats weighed 46 tons at full load, and were powered with three 1,200-hp Packard engines. Considering they did 41 knots all up and had their problems with seakeeping, I’m not entirely convinced that giving up on stepped hulls for patrol-boat service was the right move.

Nevertheless, with non-stepped hulls chosen for the navies, most folks got the impression there was something wrong with steps, or at least that standard non-stepped planing hulls were somehow superior. Finally—adding to the stepped hull’s public-relations problems—is that they’re harder to engineer properly and more expensive to build.
Stepped Speed Today?
A yacht has none of the out-of-trim difficulties that military craft have, at least, as long as you're not carrying torpedoes. If you want to go really fast, a moderately narrow (by today's standards) single-stepped hydro would be hard to beat indeed. The photo shows a model of a 42-foot stepped hydro of my design, the H.M. Pope III. The Pope'll do an honest 60 mph with twin 800-hp diesels, and she'll be able to keep going fast in weather that'd have most everyone else slowing down. Forty-two feet overall, 10-foot 2-inch beam, and displacing 8.7 tons, She's one boat that can honestly cruise at 35 to 40 knots!

Of course, production builders, such as Fountain, build both high-speed cruisers with stepped hulls as well as extreme-speed, offshore race boats.
I started thinking about this boat when *Professional Boatbuilder* and *WoodenBoat* magazines announced their next design challenge, a retro runabout I believe. I thought it was tailored for me. With what I was already trying to do with my boatbuilding business, I felt it could work both as a production fiberglass boat or a one at a time wooden boat project. The 20-foot design that I built had gotten a lot of praise, but had never really taken off in sales. So I tried to think of what I could do to get people to actually want to own one of my boats. My idea is people want to cruise around with friends, perhaps have a cocktail and a snack, hang out and just enjoy the water, of course if you want to go for a swim, go skiing or tubing, that has to fit in as well. The ladies don’t like the bucket, so I wanted to fit in a small head out forward, which also gives some privacy. That is what I have designed this boat around, secretly I have been calling this boat “Wine and Cheese” but there are be better names out there for it, just haven’t thought of one yet.

The shape of the boat itself is generally the same as my 20-foot design, just scaled up at different rates in the different directions, but it is very close to the same lines. I did spend a lot of time trying to ensure the boat has enough height inside the cockpit for the guests to feel safe, but not so much that the freeboard becomes too clunky looking, also fitting the head out forward demands some height.

As far as design properties goes, I’ll say what my countryman, and also a designer I look up to, Aage Nielsen (no relation) said about almost all of his boats, “not extreme in any way.” Displacement/length, chine beam/length, CG from transom, deadrise, etc. everything is pretty much right out of Dave Gerr’s textbook.

I am planning on offering this with a Volvo 380-hp V-8 gas engine and their duo prop sterndrive as standard, but many different propulsion systems could go in there—diesel, jet drive, straight inboard, what have you. I would be very interested in working with a client on an electric option, I have some crazy ideas in that area that I would love to explore.

For me, it’s all about form and function together, not one following another. If they don’t work together in harmony, it’s not right yet, especially
Destino 25 continued

when it comes to pleasure boats. They aren’t really necessary after all. We only have them because we love them, so of course they must be pretty. This is in the design but equally as much in the execution of the workmanship. It all must flow together. If I did everything right, this will be a boat that will be cherished for many, many years.

LENGTH OVERALL (LOA): 25’ - 0”
BEAM: 8’ - 4”
DISPLACEMENT: 4,600 lbs.
SUGGESTED POWER: 330 hp
ESTIMATED SPEED: 50 mph

Ole Nielsen
Destino Yachts
Office:
10 Pawson Rd.
Branford, CT 06405
Shop:
250 Bradley St.
East Haven, CT 06512
Tel: 860-395-9782
Email: nielsen@destinoyachts.com
Web: www.destinoyachts.com
Described at a manageable hull length of 40 feet, the Territoire 11.8m is built in STRONGALL (thick plates of aluminium with almost no internal framing). She is built to live a long time, and require no maintenance.

This exciting material is applied to a very modern sailing boat. The result is a well-ballasted, fin-keel, cutter rigged with modern proportions to sail effectively in all wind conditions, with a high level of security.

Strongly built and able to take high seas, she has a fin-keel in order to obtain high stability at high angles of heel. She is equipped with lightweight arrangements to keep total displacement low. Her displacement is equal to a classical displacement, FRP built vessel.

The electrical equipment (often source of trouble when you sail far from everywhere) is reduced to a minimum to ensure autonomy and reliability. So her crew will spend the minimum time on maintenance.

The first Territoire 11.80m, under construction at Meta Shipyard, is fitted with a dog-house, a clear deck, equipped for efficient ventilation at sea, has a large sail locker, a wooden tiller, a sheltered cockpit, a wind autopilot, solid installation for strong anchor rollers, and a quality stove.

Owing to her Strongall construction, the internal structure is very simple, which permits her to be built easily with any...
Territoire 11.8m continued

arrangement plan and any roof design desired.

Principal characteristics: LOA: 11.80m, Max Beam: 3.83m, Draft: 1.98m, Displacement: 7750kg, Keel Ballast: 2880kg, Sail Area: 82sq.m, Engine: 50hp, Diesel: 350 l (standard), Water: 400 l

Extremely thick plate used in STRONGALL construction
Extremely thick plate of STRONGALL construction allows very little internal framing.

The hull form must be of 100% developable surfaces with no twist or compound curvature of any kind.
Westlawn has taken strong steps designed to lower education costs and assist students to follow their dreams and attain their goals. These steps include new discounts for ABYC members, Westlawn's unique zero-interest tuition payment plan, and finding ways for students to obtain otherwise expensive design software at low or zero cost.

### ABYC Members get a 20% discount on all Westlawn courses

All ABYC members (except for student members) receive a 20% discount on all Westlawn courses. Contact Westlawn student services to confirm eligibility and apply: info@westlawn.edu

### Westlawn offers a ZERO-INTEREST tuition payment plan

For all four modules of our professional diploma program, Yacht & Boat Design, for our short course, Elements of Technical Boat Design, and for all our continuing-education courses. Complete details are on the enrollment form for the course you are interested in. Monthly payments are low. The goal is for our students to complete their studies at affordable prices and with no student-loan debt.

### FREE Student AutoCAD!

Westlawn has arranged for active Westlawn students to download AutoCAD online directly from Autodesk. This is a full version of AutoCAD student release. It is not a trial version. Active Westlawn students can log into the designated sign-up page through the Westlawn student forum.

This is the lowest cost for full AutoCAD ever—no cost! The commercial price of AutoCAD is $4,195, an enormous savings.

### Orca3D Hull Modeling and Rhino General 3D-Modeling Software at Deep Discounts!

In addition, Westlawn has arranged with DRS C3 Advanced Technology Center for deep student discounts on the Orca3D hull modeling plug-in software for Rhino, plus Rhino in addition, if needed.

- Orca3D Level 1 (hull design and fairing with intact hydrostatics and stability) is $1,390 commercial but just $125 for Westlawn students, a $1,265 savings!
- Orca3D Level 2 (all of Level 1 plus speed/power analysis and weight and cost tracking) is $2,780 commercial but just $250 for Westlawn students, a $2,530 savings!

Orca Level 1 is all that’s required to complete Westlawn studies, but it makes sense to take advantage of this student discount to get Level 2, which will make your advanced work go more quickly and will serve you well in your career.

You need the general-purpose Rhino (Rhinoceros) 3D modeling program to run Orca3D. If you don’t already own Rhino, DRS C3 Advanced Technology Center has arranged a special Westlawn discount package price for Orca3D plus Rhino, as follows:

- Orca3D Level 1 & Rhino $288 (commercial price $2,385)
- Orca3D Level 1 & Rhino/Flamingo/Penguin/Bongo $558 (commercial price $3,085)
- Orca3D Level 2 & Rhino $401 (commercial price $3,775)
- Orca3D Level 2 & Rhino/Flamingo/Penguin/Bongo $671 (commercial price $4,475)

Savings over the full commercial prices range from $2,907 to $3,804 depending on the package!

### The minimum suite of basic CAD software needed to complete Westlawn’s full Yacht & Boat Design Program is AutoCAD plus Orca3D Level 1 & Rhino.

The total cost of this suite of CAD software programs is just $288! This matches the lowest cost for the minimum required CAD software ever!

### FREE Scan&Solve FEA/Simulation Software by Intact Solutions!

Students can download the student version of Intact Solutions’ Scan&Solve finite-element-analysis and simulation software for free. The free student version has some limited functionality, so students may upgrade to the academic version of Scan&Solve for $295. This is the full-featured commercial software at a special price. (The commercial price $995.)

Savings over the full commercial price is from $700 to $995!

To take advantage of these deep discounts for Westlawn, students must follow the student-purchase procedure on the Westlawn student forum. You must be a currently active Westlawn student with a valid Westlawn student ID card.
The Masthead

ABYC Tech. Notes

ABYC/NMMA Test Alternative Fuel

In light of recent movement toward the allowance of E15 blended fuel, ABYC and NMMA had the opportunity to test a gasoline blended with isobutanol. What is isobutanol? It is a naturally occurring alcohol derived from the fermentation of a biomass, corn for example. Comparing it to ethanol, it is roughly 86% of the BTU’s of gasoline, where ethanol is roughly 68%. Unlike ethanol, isobutanol will not phase separate, it will act as we would like it to; water remains on the bottom while the butanol/gasoline mixture stays intact. The blend we tested was 16.1% by volume.

The Test
Several lab-based evaluations of this fuel had been and still are ongoing. What this particular company (GEVO) was interested in was an evaluation of an in-use situation. Dave Munz with GEVO provided the fuel for the season’s testing and, with the help of BRP and Volvo Penta, we were able to evaluate its effects on three boats. A twin-engine jet boat, 175-hp, two-stroke outboard, and a 3.0-liter stern drive. The test involved exhaust-gas sampling and analysis with both isobutanol and indolene, which is the test fuel used to evaluate engine emissions for the EPA.

In early June, the baseline tests were completed. A sophisticated Marine Portable Sampling System (MPSS) developed by Jeff Wasil of BRP was used to capture exhaust samples into containment bags, which were then driven to Volvo Penta where ABYC Technical Board member Rich Kolb analyzed the exhaust properties. Following the June testing, 40 hours were put on each of the test boats to simulate a typical season’s use. In late September, the whole process was repeated.

Additionally, we took the opportunity to perform materials testing. Fuel hose, primer bulbs, gaskets and even vintage fiberglass tanks were tested for compatibility with this new fuel blend. Standard industry testing resulted in no...
The Masthead

ABYC/NMMA Test Alternative Fuel Continued

catastrophic or detrimental results.

The Results
At the end of the season, the Indolene and isobutanol were virtually the same when it came to HC+NOx emissions. CO was actually reduced with isobutanol use. This data is encouraging in that it indicates no degradation in engine components over the summer use. No engine malfunctions can be attributed to the use of the isobutanol. The running characteristics were outstanding and no adverse effects were observed.

Next Steps
From a user perspective, this fuel seems to be an excellent alternative. The recently released Volvo Penta and Mercury Marine E-15 durability reports show what failures we can expect when going to a 15% ethanol blended fuel. Both these reports are available at the National Renewable Energy Laboratory website ([http://www.nrel.gov/docs/fy12osti/52577.pdf](http://www.nrel.gov/docs/fy12osti/52577.pdf) – Volvo; [http://www.nrel.gov/docs/fy12osti/52909.pdf](http://www.nrel.gov/docs/fy12osti/52909.pdf) – Mercury). All three of the test boats have been winterized with untreated isobutanol, we hope to have an equally encouraging report in the spring when the boats head back to the water.
About exhaust temperature sensors and hose clamps from the September 2014 issues ABYC Tech Notes:

Dave:

_Masthead_ is well done again. (“But of course,” you say.) However, the photo on page 14 shows a wet exhaust system with only one hose clamp on each end of the hose from the elbow to the muffler as well as the vertical hose from the muffler. ABYC P-1.7.1.10.1 states, “Every exhaust hose connection shall be secured with at least two non-overlapping clamps at each end to produce a secure, liquid and vapor-tight joint.”

OOPS!

Cheers,
Bob MacNeill

Dave Gerr Replies:

Thanks Bob. Right you are and a very important point! The only thing we can do for someone demonstrating such perspicacity, insight and sagacity is to award you a Know It All certificate. One is on it’s way to you as I write this.

Cheers,
Dave

Dave:

Regarding the Sept. _Masthead_ ABYC Tech Notes:

The column is an excellent reminder of the value of this component, as well as its need for ABYC compliance. I’m a strong proponent of exhaust alarms, I’ve written about them many times, and I recommend them to my clients and lecture attendees, as well as in every vessel inspection report I write. However, while I’m a fan of the concept, there’s no love lost between me and exhaust temperature sensors that pierce and live within the exhaust gas/water stream, like the one shown in the image that accompanied the September 2014 column. Not only is this an incredibly hellish environment from a corrosion perspective, I strongly suspect that modifying FRP mufflers, or hoses where I’ve also seen them installed, violates the manufacturer’s warranty. Drilling and tapping FRP is also frowned upon. I’ve seen piercing probes of this sort fail, blowing out, and creating a nightmarish and potentially dangerous mess as it fills the compartment with exhaust gasses and atomized, hot seawater, with the potential to cause tens of thousands of dollars’ worth of damage, and worst of all the operator of the vessel often has no indication it’s occurring until the engine begins to stall as a result of exhaust gas and water ingestion, at which point severe damage has already occurred to much of the gear in the engine compartment.

My preference is for a thermistor type sensor, one that is strapped to, rather than inserted into, the wet exhaust hose just downstream of the injected elbow. The one I prefer is made by Borel Manufacturing. Its quick-acting sensor is never exposed to exhaust gasses or water and thus lasts indefinitely (I have yet to experience a failure, and I’ve been using them for over a decade). In many cases, it reacts so quickly, that a blocked intake sets it off well before the raw-water impeller is even damaged, and long before the engine or exhaust system comes anywhere near overheating. I’ve had countless users report instances where it saved them
The vast majority of vessel manufacturers mistakenly believe that if the vessel jacket water coolant overheats, that is an indication of loss of exhaust coolant. Nothing could be further from reality. If the engine is raw water cooled, the sensor will likely not sense loss of coolant because the sensing probe will often not be in contact with the coolant and will not accurately sense the air temperature surrounding it. If the engine is fresh-water cooled, by the time the coolant has overheated due to loss of raw water flowing through the heat exchanger, the exhaust components will have likely overheated and failed.

That being said, readers may presume that the installation shown in the picture meets applicable standards. While the American Boat & Yacht Council standard P-1 is silent on threaded fittings into non-metallic exhaust components, the National Fire Protection Association standard NFPA 302 6.1.1(5) specifically states: They shall have no threaded fittings into nonmetallic exhaust system components. This was placed in the standard for several reasons (by guess who) and applies not only to threaded metallic but also threaded nonmetallic fittings. The nonmetallic exhaust components (mufflers, exhaust hose, etc.) were never designed nor intended to have threaded fittings installed. I doubt that as installed, the muffler would meet the performance requirements of UL 1129. The fitting as installed would likely not meet ABYC 1.5.10 in that the bronze would likely reach temperatures in excess of 200 degrees Fahrenheit and therefore would require protection against personal contact. Furthermore, depending on the type of thermocouple sensor being used, it may or may not respond quickly to loss of coolant. Finally, since it appears that the unit uses a bronze housing, bronze is highly susceptible to deterioration from contact with diesel and to a lesser extent gasoline exhaust vapors.

Many of the better quality metallic exhaust elbows have a pad with two threaded holes welded to the elbow and designed for mounting a thermocouple that does exactly what the thermocouple in the picture hopefully does, sends a warning signal to the helm location(s) that there has been a loss of cooling water through the elbow. With this installation there is no threaded fitting in non-metallic exhaust components.

Coincidentally, one of the last vessels I surveyed had threaded thermocouples similar to the one in Ed’s picture installed in the accordion exhaust hose close to the water injection elbow even though the plates and bolt holes for proper installation were on the elbows.

Kim I MacCartney
Marine Surveyor

Dave Gerr Replies:

Thanks Steve and Kim for the valuable additional insights into the importance of exhaust-temperature sensors and into their proper application and use. This is critical information for Masthead readers involved in design, survey and repair.

Cheers,
Dave
It’s a cross between the CSI and Cold Case TV show crime dramas: taking a look back through the thousands of dusty, old settled boat insurance claims files to identify patterns that can teach today’s boaters how to avoid becoming a statistic. That’s exactly what the BoatUS Marine Insurance publication, Seaworthy, did in the recent feature, “Top Ten BoatUS Marine Insurance Program Claims,” which appears in the October 2013 issue.

“The last time BoatUS did such a detailed analysis was in 2005, and this kind of information is not available from anyone else in the industry," said Seaworthy editor Beth Leonard. "The time seemed right to revisit our findings and share them with boaters so they can learn from other’s mistakes.” Here’s the list of the top ten claims in terms of dollar value over the last eight years, along with some tips that could help prevent becoming a statistic, or if you’re simply unlucky, lessen the damage:

#1. Hurricane: A well thought out hurricane plan can keep your boat safe in all but the most extreme storms (see www.BoatUS.com/hurricanes).

#10. Lightning: Make sure to haul out your boat after a lightning strike to check for “exit wounds” that can compromise the hull's integrity.

#9. Theft: 90% of boats are stolen on their trailers. Make it as difficult as possible to simply hitch up and run.

#8. Injury: Many injury claims involve inexperienced guests. Be sure to warn your non-boating friends about wakes, waves, slippery surfaces, and other hazards.

#7. Grounding: Accurate charts – whether paper, electronic, or on a mobile device – and a depth sounder are your best defense against grounding.

#6. Collision: Most collisions result from some combination of three factors: inattention, blind spots, and too much speed.

#5. Fire/explosion: Faulty wiring causes most fires; most explosions result from fueling issues.

#4. Striking a submerged object: If you hear a loud clunk from down under, stop and look in the bilge, and, if you find any water coming in, haul out the boat to check for structural damage as soon as possible.

#3. Weather/wind: Keeping your boat in a well-protected location away from trees is the best way to protect it from non-hurricane weather damage.

#2. Sinking: Check, squeeze, and tug all fittings below the waterline at least once a season to make sure your boat stays afloat.
against grounding. But a depth sounder’s assistance will be limited to confirming that you are indeed aground unless you know how to use it and how to plot your position on the chart. Once you are aground, waiting for the tide or a tow is less likely to do more damage than trying to power off.

6. Collision
It’s the too-close encounters with docks, pilings, and other stationary objects that help keep collisions from climbing higher up the list because these result in a lot less damage than running into another boat. (Note: Technically a collision is between two vessels, while an allision is between a vessel and a fixed object. For this discussion, we’ll use “collision” for both.) Most collisions result from some combination of three factors: inattention, blind spots, and too much speed. Inattention includes leaving the steering to the autopilot. Misunderstandings of the Rules of the Road also play a role. You won’t go far wrong if you do whatever is necessary to avoid a collision and make obvious course changes early.

5. Fire/Explosion
While fire and explosion make up only 2.5 percent of all claims in the past five years, the average payout per claim ranks second only to theft. That’s because, like theft, fire or explosion all too often results in the total loss of the boat. Faulty wiring causes most fires; most explosions result from fueling issues. Inspect your boat regularly for chafing wires or wires that aren’t properly supported and for corrosion of AC shore power inlets and damaged shore power cords. If you ever smell raw gas, something’s really wrong. Get everyone off the boat and have it checked immediately. Finally, make sure you have the proper number and type of working fire extinguishers aboard.

4. Striking Submerged Object
Between 2008 and 2012, the number of claims for striking a submerged object increased by almost 30 percent, at least in part due to the prolonged drought across much of the country in 2011 and 2012. Unlike fire/explosion and theft, hitting something below the water rarely results in a total loss. But don’t let the claim turn into a sinking. That large clunk from down under could have put a huge strain on struts, stuffing boxes, and other underwater gear. Stop and check the bilge for leaks and, when you get back to the dock, check again — thoroughly. Any water could mean serious damage and a haulout (covered by insurance, but notify BoatUS Marine Insurance first) is in order.

3. Weather/Wind
Non-hurricane wind and weather damage advanced farther up the ranks from 2005 than any other category. That reflects the devastating storms of the last few years with heavy snowfall across much of the country in the winters of 2009/2010 and 2010/2011, the second most active tornado season on record in 2011, and the wind storm called a super derecho that affected a dozen states in June of 2012. Most of the advice on preparing for hurricanes applies to these other storms: minimize windage, tie your boat securely, and guard against chafe. Unfortunately, for many of these storms you’ll get considerably less warning than for a hurricane. So our best advice is to keep your boat in a well-protected place.

2. Sinking
The first rule of boating: Keep the water out! All too often when that simple rule gets violated, the boat ends up a total loss. In 2011, the dollars paid out for sinking claims exceeded the payouts from Hurricane Irene, though Irene generated more than 10 times the number of claims. Water most often finds its way in through those pesky holes below the waterline. Many underwater holes have a way to keep them closed when they’re not needed — seacocks. But seacocks must often remain open, so it falls to lesser fittings like hoses and clamps to keep the water out. Check, squeeze, and tug on all fittings below the waterline at least once a season to make sure your boat stays afloat.

1. Hurricane
Between 2008 and 2012, there were three major hurricanes — Ike, Irene, and Sandy — and the last two had claims numbering in the thousands. Our average payout per claim, however, comes in at #10 and ranks significantly below other categories where the entire boat is often lost — like theft, fire/explosion, and sinking — for two reasons. First, the increasing use of the hurricane haulout provision by our insureds has reduced losses. Second, our skilled and efficient Catastrophe Team handles large numbers of boats at one time and can negotiate the best rates for salvage and wreck removal. Hurricane preparation begins with the development of a well-thought-out hurricane plan (see www.BoatUS.com/hurricanes).

Go to www.BoatUS.com/toptenclaims for the full story.
Source: BoatUS Press Room at www.BoatUS.com/PressRoom
Press release 10/23/13
Know It All Contest Solution to the September 2014 Question
On the Missing Feature in a Bulwark Frame
(This issue’s new Know it All question is on page 33)

The Know It All questions and correct answers are important design tips for students as well as other marine professionals. We suggest that you file them away for future reference.

The Question Was:
What important feature is missing from the configuration of the bulwark frame pictured in the photo on the right?

The Winners Are:
We received ten answers to the September 2014 Know It All question. Amazingly, all ten were correct!! This unprecedented demonstration of perspicacity, brain-power, sagacity and gumption on the part of readers of The Masthead clearly indicates that our subscribers are simply too smart for their own good. The correct answers were sent in by: Bill Brailsford, CWO Scott Harroun USCG, Michael Dearborn, Eric Ogden, Pierre LaRochelle, Shawn Bartnett, James Hart, Tom Lathrop, Jim Trimble and Leslie Newton Allen.

Naturally, only the first three correct answers received qualify to receive the Know It All Certificate, Westlawn T-shirt and cap. These most expeditious of our brainiacs were Bill Brailsford, CWO Scott Harroun USCG, and Michael Dearborn. We have no choice but to award each the official title of “Know It All.” Henceforth, these wizards must be addressed exclusively as “Mr. Know It All” by all and sundry.

The Answer Is:
The bulwark rail is missing the very important limber hole. It is surprising how often I see boat’s missing this feature. Without the limber hole in each and every bulwark frame, water will collect and cause rust and corrosion or—on wooden boats—decay. Indeed, there is a brown spot in the corner of the bulwark frame in the photograph, which looks—in this photo—almost like it might be a small hole. It is, however, a deep rust pit well started.

As pictured in the drawing to the right, the limber hole radius should be one-third the depth of the bulwark frame. For boats the limber should always be a quarter of a circle in order to insure maximum open area. Ships—being much larger—can cut these limber openings straight as a triangular opening. This is because ships are so large that the limber area will be sufficient even when cut straight.
Who Will Be The December 2014 Know It All Winner?
Email your answer to: editor@westlawn.edu

Want to see how much you know? Want to show everyone else how much you know? The first three people to submit the correct answer to the following question will win a Westlawn tee shirt and cap, and will also receive a Know It All certificate. The answer and winners to be published in the next issue of The Masthead.

Can you name/identify the type of rig for each of the 18 boats pictured at the right, including a brief explanation of why the rig is called what it is. Allowances will be made for regional differences and alternate names.
Boats Sink in Winter
How could a 36’ sailboat with over three feet of freeboard be shoved under water by a few inches of snow? Because a plastic through-hull that was an inch or two above the waterline had cracked and the weight of the snow lowered the damaged fitting to just below the surface. Water then began entering through the crack and the boat gradually filled with water and sank. Plastic deteriorates quickly in sunlight, which is why ABYC’s H-27 standard requires that through-hulls above the waterline must now pass a UV test. As a result, this sort of sinking is less common than it once was.

Wrong Wires Enflame Boats
The boat to the right had just made the crossing from Miami to the Bahamas for a leisurely vacation cruise when the owner noticed the depth sounder acting erratically. Seconds later, he smelled smoke and immediately shut off the engine and raced below. Smoke was pouring out of the forward cabin. His friend, still on deck, yelled that she could see flames. The owner called a hasty mayday and then had everyone climb into the boat’s inflatable. Fighting the fire proved futile; within minutes the $250,000 boat was engulfed in flames. Although the boat had burned to the waterline and sunk, investigators were able to determine that sometime during the boat’s life, someone had used household "romex" wire for a circuit. Because romex—a wire typically used in homes—has a solid core, it eventually work-hardened and broke from constant motion. The resulting short had produced tremendous heat, which started the fire. Boat wire leads a hard life and must be able to resist heat, chemicals, salt water as well as constant motion and vibration. Marine grade boat cable can be tin-plated for corrosion resistance and even though the standards are silent on this issue in my opinion should be the only type of wire used on a boat.

Thanks to Bob Adriance, ABYC Technical Board and Member, BoatU.S. retired, for the above mentioned cases.

IBEX 2014 Reports 47 Percent Increase in Attendance
BROOKLIN, ME, October 8, 2014 - Organizers of the International Boat Builders’ Exhibition & Conference (IBEX) announced today the 2014 event, which took place in Tampa, FL September 30 through October 2, attracted 6,900 attendees, a 47 percent increase compared to 2013. IBEX, the industry’s premier trade show, drew marine industry professionals from around the globe to learn about and explore the newest in marine innovation from 558 exhibiting companies - a 15 percent increase in exhibitor participation compared to the 2013 show.

“IBEX in Tampa offered an impressive increase in our attendance and exhibitor participation and a significant WOW factor,” said Anne Dunbar, Show Director of IBEX. “The new products and technologies introduced this year were incredible, and you could feel the excitement and enthusiasm all three days of the show.”

In addition to the spike in attendance and exhibitors, seminar registration was up with more than 500 attendees participating, an increase of six percent from 2013; and there was a 35 percent increase in international attendance from 2013.

The growth of the 2014 IBEX was a reflection of the state of the boating industry. Thom Dammrich, president of the National Marine Manufacturers Association (NMMA), who presented at the Industry Breakfast, stated, "We’re anticipating good times ahead for recreational boating. The industry continues to see healthy growth with retail expenditures increasing 3.2% in 2013 to $36.9 billion. Americans are taking to the water in record numbers, and we’re anticipating continued steady growth of 5-7% in new powerboat sales through 2014. Now is the time for marine innovation.”

IBEX attendees were able to experience and learn about the latest products during the three-day event. There were a record number of new products on display and Innovation Awards’ participants, as well as new on-the-water demonstrations, multiple networking events, and educational seminars and workshops.

The 2015 IBEX is scheduled to take place at the Kentucky Exposition Center, September 15 - 17, in Louisville, KY USA. For more information, please visit www.ibexshow.com

The Miami International Boat show plans to move to the renovated Marine Stadium in 2016
The National Marine Manufacturing Association is planning to move its boat show from its current location in Miami Beach to the Miami Marine Stadium located further south on Biscayne Bay by 2016.

Currently, the Stadium is in a hurricane-battered condition and is covered with graffiti, but sources familiar with the agreement to move, stated that the boat show, one of South Florida’s largest tourist events, could play an important role in the financing of a $30 million renovation of the run down stadium that once was the venue for speedboat races and pop music concerts. Thom Dammrich, NMMA’s president, is expected to announce further details regarding questions as to whether the boat show will return to Miami Beach, where renovations to the city’s convention center all but forced the show’s relocation.

Source: Miami Herald 11/12/2014

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Essential Continuing Education
For Marine Surveyors, Boatbuilders, Managers and Small-Craft Designers

Fiberglass Boatbuilding Materials & Methods (Course No. BC 401)

This comprehensive distance-learning course provides instruction in the fundamental concepts of sound fiberglass boat construction practices and structural calculations.

This course focuses on current information on fiberglass/composite and related boatbuilding materials, and the best techniques for using them. Topics include: reinforcement fibers, resin systems, core materials, mold construction, production-facility requirements, boatbuilding methods, elements of strength of materials, laminate design and specification, assembly of components, and design examples.

NOTE: This course consists of lessons excerpted from Westlawn’s larger Elements of Technical Boat Design course and also in the full Yacht & Boat Design Program. On completion of BC 401, students may transfer into either program and receive full credit.

CLICK HERE for a detailed syllabus
CLICK HERE for more details and enrollment information on this and other Westlawn essential continuing education courses

Elements of Technical Boat Design (Course No: ETD)

Elements is a comprehensive introduction to the fundamental concepts in yacht and boat design for marine professionals. Students will gain a firm understanding of resistance, hydrostatics and stability as well as fiberglass design. Topics include: Hydrostatics, Stability and Trim, Principles of Resistance, Drawing of Hull Lines, Ergonomics and Interior Design, Fiberglass Boat Design and Construction. Note: Graduates of Elements may transfer to continue on and complete the full professional Westlawn Yacht & Boat Design Program, receiving credit for all the subjects covered in the Elements course.

“Since I have added Elements to my resume I have had several job offers from different companies and even a promotion with the company I am employed with now. If any one is wondering if it would be beneficial to complete the program, I would say YES.”

Charles Bursk
Tiara Yachts

CLICK HERE for a detailed syllabus
CLICK HERE for more details and enrollment information on this and other Westlawn essential continuing education courses

ABYC Courses and Schedule for 2015

The ABYC education department has been providing industry certifications, training, high school and college curriculum, and industry seminars for over twenty years. They are providing the marine industry with the skilled workers required to build and maintain modern small craft of all types.

ABYC is currently scheduling on-site and factory training for 2015. Please call ABYC for custom tailored, flat rate, instruction by top industry trainers at your facility (410-990-4460, Ext. 104).

The Marine Technician Certification Program developed by ABYC with “NOCTI Certification”* has proven to be the industry standard. ABYC continues to provide the highest quality marine education and training throughout the country and throughout the year.

For course dates and descriptions Click Here

*NOCTI (National Occupational Competency Testing Institute) is a regular provider of the assessments on which many certifying bodies depend for measures of applicants’ standards-based knowledge and skills. Certificates benefit employers by showing that applicants have acquired specific skills. The status of having a certified staff can lead to higher sales and customer satisfaction.
**Advance Your Career, Train Your Employees**

ABYC is the acknowledged leader and certifying body in education for the marine industry. We offer technical classes that progress from entry level to advanced courses, meeting the needs of every experienced marine professional seeking improved skills. ABYC educational programs support the career path of individual technicians and provide a training curriculum for marine businesses. Our goal is to provide continuing, convenient education to improve the quality and professionalism of our industry.

**Learn About the ABYC Certification Program & Courses**

Read about the ABYC Certification program, who should become certified, how to certify and the eight different areas you can get certified in.

**Need to Re-Certify?**

The two most important reasons to recertify are your career and yourself. If your certification is about to expire, be sure to contact ABYC Education about recertification.

**ABYC Class Schedule Through 1/27/2015**

- **Introduction to Basic Marine Electric and Corrosion Protection** *(Bayfield, WI)* 12/8/2014 » 12/11/2014

- **ABYC Marine Electrical Certification (Ft. Lauderdale, FL)**
  CLASS FULL!
  12/8/2014 » 12/11/2014

- **ABYC Marine Systems Certification Fast Trac (Lansing, MI)**
  12/10/2014

- **ABYC Composite Boat Builder Certification (Brunswick, ME)**
  12/15/2014 » 12/17/2014

- **Standards Week and Annual Meeting 2015**
  Location: Seattle, Washington
  1/12/2015 » 1/15/2015

- **ABYC Standards Certification (Glen Burnie, MD)**
  Time: 8:30 AM Daily 1/13/2015 » 1/15/2015

- **ABYC Standards Certification Course (Seattle, WA)**
  1/13/2015 » 1/15/2015

- **Exploration Into ABYC Basics: Electrical, Systems & Corrosion**
  Location: Seattle, Washington  Time: 1:00 PM until 5:00 PM 1/14/2015

- **Aquatic Invasive Species Summit**
  Location: Las Vegas, Nevada  1/27/2015 » 1/28/2015

With integrity, pride in our product, and commitment to building long term relationships with our customers, Armstrong Marine, Inc. was launched with the goal to build the best boat on the water. It is that goal that drives us today.

With that in mind, Armstrong Marine set aside $80,000 for training in 2012, and the majority of the systems training will be through ABYC. Training with ABYC insures increased profitability through better trained and more efficient employees while also ensuring better safety and service.

Cory Armstrong, Owner, Armstrong Marine, Inc

Our goal at Diversified Marine Services, Inc. is to have all of our long term technicians certified to the “Master ABYC” status and to help pass this valuable information onto our client base. I feel like we are in partnership with the ABYC organization!

Thomas F. Kicklighter, Diversified Marine Services, Inc.
ABYC Webinars

ABYC is now offering webinars as a new and exciting learning tool to train marine professionals. Webinars are good for you and your company because they:

- Are relatively inexpensive
- Are monthly
- Are current and topical
- Can be viewed in real time or on your own time
- Can be archived for members
- Help you train your staff
- Give you a taste of an ABYC certification class

A typical webinar might feature an ABYC instructor or other industry expert doing a 60-90 minute talk with a PowerPoint presentation on a relevant topic. You might hear Ed Sherman talking about new battery technology or Captain Dave Rifkin discussing corrosion or John Adey explaining the details of a new ABYC standard. We have learned how to stream these presentations to your computer in your office with top quality sound, graphics and deliverability.

Order a pizza and gather your technicians in for a shop lunch. Have them all listen and view the presentation. Each one of them will learn something to take to the boat with them. This will make expertise and knowledge synonymous with your company and your technicians.

Go to the class calendar on the ABYC Website and sign up for one.

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RINA organizes a programme of international conferences, workshops and training courses covering a broad range of experience and opinion on research, development and operation on all aspects of naval architecture and maritime technology. For more information about any event, click on a title.

**2015 Events Program**

**Design & Operation of Wind Farm Vessels**
28-29 January 2015, London, UK [Registration Open]

**Structural Load & Fatigue on Floating Structures**
25-26 February 2015, London, UK [Call for Papers]

**Damaged Ship III**
25-26 March 2015, London, UK [Call for Papers]

**HMPV China**
10-11 April 2015, Shanghai, China [Call for Papers]

**Contract Management for Ship Construction, Repair & Design Course**
22-24 April 2015, London, UK [Registration Open]

**Ice Class Vessels**
28-29 April 2015, London, UK [Call for Papers]

**Basic Dry Dock Training Course**
26-29 May 2015, London, UK [Register Now]

**ICCAS 2015**
30 September - 1 October 2015, Bremen, Germany [Call for Papers]

**High Performance Sailing Yachts 2015**
28 - 29 October 2015, Southampton, UK [Call for Papers]

**Design & Construction of Super & Mega Yachts**
13-14 May 2015, Genoa, Italy [Call for Papers]

For a complete listing of upcoming RINA events, go to: [www.rina.org.uk/events_programme](http://www.rina.org.uk/events_programme)
SUBSCRIBERS

There are over 9,500 subscribers to *The Masthead*, Westlawn Institute's quarterly e-journal. Our readers are yacht and boat designers, boatbuilders, marine techs, surveyors, boat design students, and members of the boating public.

See and Hear Dave Gerr’s Interview with Mad Mariner Magazine

*Mad Mariner*, the online daily boating magazine, interviewed Westlawn director Dave Gerr on July 20, 2010. In this wide-ranging, half-hour radio show, Gerr discusses almost all aspects of Westlawn, including history, operation, student and alumni successes, costs, and more. Click on the links below to listen to the full interview and watch the accompanying slide show of over a hundred boats designed by Westlawn alumni.

Click Here to watch on Windows PC  
Click Here to watch on Macintosh

Who We Are

Westlawn is a not-for-profit educational affiliate of the American Boat and Yacht Council (ABYC). Our school is nationally accredited by the Distance Education and Training Council (DETC), and is listed as an accredited school by the U.S. Department of Education and by the Council for Higher Education Accreditation. The Westlawn Yacht & Boat Design Program is also accredited by the Royal Institution of Naval Architects (RINA).

Our Mission

Founded in 1930, the mission of the Westlawn Institute of Marine Technology is threefold:
- To provide our students with the skills and knowledge required to build a rewarding career in the profession of yacht and small-craft naval architecture via distance learning.
- To support continued growth of the recreational and small-craft marine community through the development of well-trained, safety-oriented, boat designers developing better products for the benefit of the boating public.
- To provide continuing education to marine-industry professionals.

Westlawn Institute of Marine Technology  
c/o Maine Maritime Museum  
243 Washington Street  
Bath, Maine 04530 USA  
Tel: 800-832-7430  
Tel: 207-747-0088  
Fax: 207-747-0084  
E-mail:  
Student Services: magesner@westlawn.edu  
Information: info@westlawn.edu  
The Masthead: editor@westlawn.edu  

We're on the Web at  
www.westlawn.edu  

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