

WHAT'S A MULTIHULL?

For those who have little or no idea

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Basic Multihull Configurations

1. Catamaran....Two hulls, identical, spaced wide apart
2. Trimaran.....Three hulls, one larger in the center, one smaller on each side
3. Outrigger.....Two hulls, one large and one smaller
4. Proa.....Like #3 but proceeds with either end forward

Basic Multihull Types

Type I Ancient Multihulls

Type II Modern Multihulls

Of the modern multihulls, there are two types:

Type A: Sailing Multihulls

- A1. Daysailers
- A2. Ocean cruising yachts
- A3. Ocean racing yachts
- A4. Excursion vessels
- A5. Sailing workboats

Type B: Powered Multihulls

- B1. Runabouts
- B2. Motor yachts
- B3. Commercial Ferries
- B4. Military vessels
- B5. Powered workboats

See Abstracts below for more detail

C:
FACETS
On The Multihull Gem
Some aspects Of Modern Multihulls

- C1 History
- C2 Personalities
- C3 Technology
- C4 Adventure
- C5 Efficiency
- C6 Counterculture
- C7 Racing
- C8 Cruising
- C9 Safety
- C10 Industrial applications
- C11 Military applications
- C12 Multihull seamanship
- C13 Multihull Design
- C14 Multihull Construction
- C15 Lifestyle

Please See [Abstracts](#) below for more detail.

Note: Any one of these aspects, or some inspired combination of them, could become the focus of a video documentary, or series of documentaries. The purpose of this treatise is to assist in selecting – or combining – from among the aspects. In an effort to broaden the marketing appeal of such production(s), it may be that some entirely unexpected essence will emerge. Any approach that relieves the traditional, elitist, almost sectarian nature of yachting, and instead reveals the multihull's renegade, countercultural beginnings, and indicates a topical, human-survivalist future, could make a huge difference in what otherwise is in danger of becoming academic nautical history.

ABSTRACTS

Brief descriptions of items listed above

I Ancient Multihulls

Early Micronesian and Polynesian people explored and colonized all the islands of the Southwestern Pacific in their multiple-hulled vessels. Ancient multihulls also spread across the Indian Ocean as far as East Africa.

These craft had four distinct configurations. The twin-hulled catamaran; had two equal hulls set wide apart with a bridge decking between. However, probably the double outrigger canoe (today's trimaran) came first. It has a large, central hull with two smaller outrigger hulls, set out one on each side. The single outrigger canoe (today's "outrigger") was, and still is, used mainly for paddling, although sailing versions also existed and still do. Then, the so-called proa, or Micronesian canoe, also has two unequal hulls, but it sails both ways, that is, either end forward. The least developed in modern times, the proa has inherent efficiencies that make it of interest for future multihulls.

All four of these basic multihull configurations were given to us by the ancient mariners and are in use today, albeit somewhat evolved to utilize present day materials and our modern understanding of aero-and-hydro dynamics.

[Still images of ancient multihulls are available, and some video of ancient multihull re-creations are available.]

II Modern Multihulls

The word "modern" is applied here to mean, essentially, light weight. While some multihull activity occurred prior to WW II, it did not benefit – for the most part – from the development of strong, lightweight materials made commonly available after the war. One exception was the work of Nathaniel Herreshoff, dean of American yacht design, who created several sophisticated, light weight catamarans in the late 1800s. Racing in these boats, he humiliated the New York Yacht Club, and the multihull type was consequently banned from yacht racing. This essentially halted multihull development for fifty years and initiated the mono/multi antithesis, a countercultural phenomenon, which has prevailed until the recent Americas Cup competitions, now exclusively sailed in multihulls.

Modern multihulls come in two basic types:

Sail-powered (type A) and engine-powered (type B).

Type A: Sailing Multihulls

There are roughly five types of sailing multihulls, some of which include outboard motors or inboard engines, but their design is focused on being powered by the wind::

A1. Daysailers....

These are small, trailerable or car-toppable vessels, normally without overnight accommodations, used for daytime recreation and racing. The most popular are the "beach cats," small catamarans like the Hobie Cats, which now constitute by far the most numerous sailing craft of all time, with something over 2,000,000 vessels produced to date and still counting. There are some small (20' or less), trailerable trimaran daysailers, like the Windriders of the author's design, plus many designs for owner building.

Larger trailerable multihulls, like the Stiletos and Corsairs, come in sizes up to 30' long and more. These have minimal overnight accommodations, and most trailerable multihulls either disassemble or fold to achieve trailering width

In the early 1960s, the Hobie Cat type daysailers caused the multihull to begin its ascendance into popular culture. This sociological phenomenon happened entirely outside of the traditional, elitist, yachting community, and as such was considered renegade from its outset.

A2. Ocean Cruising Multihulls.....

This type includes interior, overnight accommodations for the crew, and usually some form of auxiliary power. Many of these vessels have achieved extended ocean voyages, their crews (sometimes families) living aboard for years at a time. The catamaran yachts, especially, have proven quite commodious, with great privacy achieved in the outer hulls and communal living in the bridge deck between. Such craft contain all the systems needed to support comfortable habitation and satellite navigation, and are now the vehicles of choice for "term chartering" with or without a professional crew. A major portion of today's recreational marine business is in this type of for-rent, "condo cruising," and activity in this type of multihull represents the only growth area in an otherwise very depressed, big boat marketplace today.

A3. Ocean Racing Multihulls....

Very lean, lightweight, Spartan versions of A2 with huge sail plans, these craft reach 150' in length, and now hold all the major ocean racing records (at least where they are

allowed to compete). The technological development of these vessels has advanced rapidly since the 1960s to now commonly utilize aerospace materials and engineering. They can cross oceans at ocean liner speeds, sail much faster than the ambient wind is blowing, and are sometimes fitted with hydrofoils to make them “fly” above the waves. The trimaran type currently prevails offshore, but catamarans are chosen for inshore competitions such as the Americas Cup. Indeed, multihull ocean racing has sparked fierce international rivalries, and contributed greatly to the overall advent of modern multihulls.

The current thrust in hydrofoil-borne, sail powered, racing multihulls is focused on speed, but the future of this technology addresses the number one problem of commercially transporting human beings on water; seasickness. Hydrofoils, when combined with the steadying effect of sails and the inherent stability of multihulls, can achieve by far the smoothest ride of any surface vessel type. This makes large, commercial, wind powered, hydrofoil-borne multihulls of special interest in the energy-efficient future.

A4. Excursion vessels....

Called “day charter” boats, these “cattlemarans” can approach 80’ in length and are Coast Guard certified for carrying up to 150 passengers on short excursions for snorkeling, dining, whale watching and sunset partying. Now operating in all the warm-water resort areas of the world, these boats (mostly catamarans) have introduced literally millions of people to the sensations of multihull sailing. Some can embark passengers directly from the beach in front of their hotels, and commonly expose their patrons to speeds exceeding 20 knots under sail in true comfort and safety. Some “term charter” trimarans also exist.

A5. Sailing workboats....

In the 1980s, the author and others conducted several boatbuilding training projects in developing countries. Sail power was used on multihull vessels to minimize running costs for peasant watermen working in artisanal fisheries and transport routes. Sponsored by the World Bank, USAID, the FAO and private clients, these projects proved premature, but the designs and construction methods were successful until fuel prices dropped again. Images of these efforts could be used in a segment focused on the future, when the energy crunch may well stimulate a revival of such vessels

Type B: Powered Multihulls

There are roughly five types of engine-driven multihulls. Designed expressly for motoring, sails are not normally included:

B1. Runabouts....

The usual single-hulled, recreational motorboats, such as for fishing, water skiing and express transportation all have their multihull counterparts. Usually catamarans, these small multihull motorboats are exceptionally seaworthy, and in the larger sizes can be driven at very high speeds. This causes the bridgework that joins the twin hulls to act like a wing, generating aerodynamic “ground effect,” which makes them exceptionally smooth riding in rough seas. When operated at lower, non-planing speeds, their narrow hull forms are easily driven even when heavily loaded, making them relatively fuel efficient.

B2. Motor-cruiser yachts....

Catamaran “cabin cruisers” of all sizes can exhibit all the performance properties of their smaller B1 counterparts, plus enjoying exceptionally commodious interiors. Some have been shown to travel nearly twice as fast on roughly half the fuel of their monohull counterparts. The prospect of rising energy costs suggests that there is a promising future for this type.

B3. Commercial Ferries....

There are presently dozens of large (up to 400’ers) commercial ferry boats operating worldwide. Most are catamarans, but the highest speed for the lowest operating cost for the greatest comfort and safety is now achieved by three-hulled, aluminum, fast, ocean-going ferry boats.

B4. Military vessels....

Various types of multihulls are under development by the military as described in Abstracts, C 11.

B5. Powered workboats...

With the exception of carrying very heavy loads, any of the four multihull configurations can be developed for specific workboat service – and for all the same reasons: Speed, motion, safety – and especially fuel economy. Many examples exist today, but again, the prospect of rising energy costs, and rising sea levels creating many new waterways, all suggest portent for this type in the future.

**C:
FACETS**

Some Aspects of Modern Multihulls, Explained

C1 History

Sometime in the late Stone Age, early Micronesians and Polynesian people made extended offshore voyages to explore and colonize all the South Pacific Islands in multihulls made entirely of vegetable fiber. This happened at a time when the Phoenicians (the first European, monohull seafarers) were just beginning to find their way down around the Horn of Africa, always within sight of land. With time, this multihull architecture found its way eastward across the Indian Ocean to the East Coast of Africa. Multihull vessels on the ancient patterns are still in use by the hundreds of thousands today in these regions. So it is that modern multihulls are a classic case of re-invention, a recombination of old ideas, an application of modern technology to an ancient concept.

The history of modern multihulls, now only about fifty years old, represents an absolute sea change in marine architecture, with the prospect of another fifty years of technical development bringing this know-how into a similar level of importance to humankind as were the ancient multihulls to the ancient people

C2 Personalities

Many individuals have invested substantial portions of their lives, some life itself, in creating modern multihulls. A pioneering spirit, complete with all its risks, calamities, triumphs and joys, attends these people, each with his or her story of life among the multihulls.

The author has been privileged to know many of these modern multihull pioneers. With the help of Scott Brown, a Canadian cinematographer (no relation to the author), our OUTRIG PROJECT has collected on-camera interviews with many of these pioneering multihull designers, builders and sailors. This video material is now available for assembly with other footage to create a documentary on the revolutionary advent of the modern multihull. Our OUTRIG Project also has collected the design drawings and memorabilia of several luminary multihull designers. These artifacts are now archived in the library at The Mariners Museum, Newport News, Virginia, and forms the basis of what promises to be the central repository for much of modern multihull history. Images of these artifacts also are available for inclusion in a definitive documentary.

C3 Technology

The initial technical advance for modern multihulls – the thing that made them “modern” – was light weight. After WW II, strong, light materials like plywood, aluminum, fiberglass and synthetic fibers for cordage and sails, all became commonly available. These together with increased understanding of hydro-and-aero dynamics, and the multihull's easily driven, narrow individual hulls, all contributed, but by far the most meaningful advance was to get the lead out.

To achieve stability, traditional monohull sailing craft are burdened with ballast, usually a lead casting fastened to their bottoms that comprises roughly half their total weight

and greatly extends their depth. By contrast, multihulls achieve stability not with dead weight down beneath, but with live buoyancy out beside. This roughly doubles stability, roughly halves weight, and greatly reduces the depth of water needed for the vessel to pass. Moreover, greater stability vastly increases the utilization of windpower in the sails, and because performance is a function of power-to-weight, reducing the vessel's weight by half and greatly increasing its power profoundly affects performance. Removing the lead keel also permits multihulls to pass through shallow water.

Many other technical advances have been spearheaded in multihulls, including the use of aerospace materials, computer-aided design, and the coming of rigid wing sails and hydrofoils – each a compelling story in itself – but the main technical advantage of the multihull is its combination of light weight with great stability and shallow draft

C4 Adventure

Fifty years of multihull seafaring have yielded a trove of sea stories, some of which could not happen in single-hulled vessels. The Outrig Project has collected some of these on camera, but many more in a series of recorded telephone “Conversations With Jim Brown” Snippets of these are posted on our Website, and the series is available by subscription. We can select from these and shoot them on video as needed. Some truly great adventures are thus available.

C5 Efficiency

The essence of the multihull is energy efficiency. In the sailing boats, the “fuel” is free and this “wind machine” makes very efficient use of it. In the engine-driven multihulls, the very narrow hulls are easily driven even through big waves, and their reduced rolling and pitching further increases utilization of propeller thrust. These efficiencies become of great interest as fuel prices increase, especially in the future when running costs reach the point where at least partial use of wind power becomes attractive. This prospect makes the sport-driven multihull technology of today commercially portentous for the future.

C6 Counterculture

Beginning in the late 1950s, multihulls attracted a free-thinking, risk-taking clientele, that was seen by the Corinthian community as “lunatic fringe.” The boats were called “anti-yachts” and “unsafe on any sea,” and some multihullers were called “multilubbers” and even “the Hell’s Angels of the Sea.”

This reputation was, to some extent, earned. The early seagoing multihulls were mostly built by their owners, often to plans drawn by amateur, pioneering multihull designers. This resulted in some rather ramshackle results. Furthermore, after building came sailing, and many early multihullers had to learn their seamanship the hard way, and in public. Some lubberly displays caused great hubbub in the yachting community through the 60s and 70s because, occasionally at least, multihulls would demonstrate their

remarkable potential in both racing and cruising, which traditional yachtsmen found threatening.

The author, who purveyed multihull designs in that period, now considers the cultural foment of the time (wherein the vocal minority evolves into the normal majority, to have contributed to a gradual, hard-won acceptance of multihulls. Indeed, the early multihulls were just one example – albeit a good example – of the counterculture in America, Europe and down under. Little remains today of the old mono/multi schism, and after fifty years the Holy Grail of yachting – the Americas Cup – promises to take multihulls into the main stream of popular culture. It's a shame in a way. We have lost the exclusiveness of being “yachting's underdogs.”

C7 Racing

Competition has played an important part in the technical development and market acceptance of multihulls. A busy, worldwide regatta schedule was used to promote the early Hobie cats, ocean racing stimulated the design development of seagoing multihulls, and now, multihulls are conspicuous in the “raid” type of small boat competitions. Nevertheless, attempts by multihull sailors to enter into the same racing fixtures as monohulls has caused considerable dissent. Traditional sailors were understandably distressed by the often-superior performance of multihull entrants. Race organizers often compromise by giving multihulls their own start, where they race only against each other in their own class. The multihull class is usually started first, to avoid the embarrassment of them sailing through the fleet of monohulls. Today, certain events are staged for multihulls only.

C8 Cruising

Multihulls for voyaging, whether local or trans-ocean, are distinctly different from the racing type. Designed to carry much more weight, they include large tanks for carrying water and fuel, at least four anchors and ground tackle, equipment for fishing, diving and water sports, plus the myriad amenities required and desired for extended living aboard. Failing to contend with this weight by naively optimistic designers and sailors has led to many overloaded cruising multihulls with consequent structural and safety problems. Furthermore, a cruising payload seems antithetical to the basic multihull premise of light weight. Nevertheless, with a crew that respects the “back packing” – rather than the “pack ratting” – nature of multihull cruising, and when their vessel is properly designed, built and operated, such craft can achieve significant trans-ocean voyages, including circumnavigations, and even serve as extended family homes.

Passage times for cruising multihulls are often somewhat faster than for their monohull counterparts, but speed, per se, often is not the main attraction in cruising. More than any other type of vessel, proper cruising multihulls enjoy an unprecedented combination of superlative seakeeping properties *together with* shallow draft. It is this combination that opens up a vast amount of cruising territory normally inaccessible to deep-keeled, traditional cruising vessels.

It was this combination of features, plus the chance to build your own ocean cruiser at modest cost, that catalyzed the 1960s surge in multihull cruising. By offering comprehensive building plans to amateur builders and some sage advice to green horn ocean voyagers, the author and his colleagues managed to catch this wave. However, it has since subsided, so today most cruising multihulls are produced in factories, are astronomically expensive, and are often operated on charter.

C9 Safety

Monohulls can sink, multihulls can capsize. This inherent difference was a huge deterrent to the early, public impression of seafaring multihulls. Indeed the “Capsize Bugaboo” still restrains multihull acceptance.

Accounts of early multihull capsize offshore were widely publicized for their inherent difference from sinking: A sunken boat disappears from the face of the earth, leaving its crew either drowned or huddled in a life raft. Whereas, the crew of a capsized multihull leaves its crew able to inhabit the upturned vessel as castaways, with access to much of the boat's contents. Such castaways have been known to survive for as long as four months, and arrive ashore in such good condition that their tales of survival were disbelieved.

Racing multihulls, by “virtue” of their extremely powerful sail plans and their extreme light weight, are prone to capsize, especially when operated without reserve in the heat of intense competition. This threat is now accepted like the threat of sinking in monohulls. Cruising multihulls, by contrast, rarely capsize even in the great storms that victimize traditional boats and crews in the same vicinity and the same storm. Fifty years of accumulated experience now supports the conclusion that multihull capsize is no more likely than monohull sinking, and the aftermath of capsize is much preferred to the aftermath of sinking. Furthermore, the consequence of other, far more common marine catastrophes, such as fire, collision, stranding, shipwreck, and the prospect of falling overboard (the greatest single danger) are all best addressed by multihulls.

C10 Industrial Applications

This aspect of modern multihulls includes specialized research fishing and prospecting vessels, but is presently best illustrated by the host of fast ferries now operating worldwide. With the prospect of rising sea levels opening many new routes, the future for this type is promising. When combined with hydrofoils, rigid wing-sails, and the looming constraints on air travel due to its high cost and pollution, this sail-assisted, multihull ferry technology may be important to the future of humankind.

C11 Military Applications

The latest class of the US Navy's strategic ship, (“pirate buster”) – of which two are stationed in Norfolk – resembles the trimaran fast ferries. A sailing, foil-borne stealth

drone is under consideration for its ability to operate in silence while listening underwater. The aircraft carrier seems an obvious candidate for the multihull; it can feature two, parallel runways for simultaneous takeoff and landing, would have the least rolling motion during flight operations, achieve the highest speed to windward to assist landing and takeoff, and boast the lowest running cost. Its multiple hulls would probably offer the greatest damage survivability.

C12 Multihull Seamanship

Most skills of seamanship apply similarly to multihulls and monohulls, but certain differences exist. In particular, special tactics for surviving great storms, and in preparing for various calamities, deserve special consideration by multihull seaman. These considerations are addressed in the author's 1983 book entitled, "*The Case For The Cruising Trimaran*" (updated 2012).

C13 Multihull Design

There is no magic in designing multihulls, but there are some significant differences relative to monohulls. The sprawling platforms can produce severe global torsion, the added stability causes far greater mast and rigging stresses, and higher speeds severely tax rudders, centerboards and hydrofoils. Analysis of the "free body," and fifty years of experience, has reveals certain unexpected failure modes, and multihulls have substantiated the old engineering axiom, "The more sophisticated the design solution, the more catastrophic the design failure." However, our increasing understanding of these challenges, together with the marvelous new materials now available (like epoxy, carbon fiber, Mylar sails and spectra cordage) have imparted a remarkable security to the robustness and durability of modern multihull structures.

C14 Multihull Construction

These boats have been built in many settings worldwide. They began by being built entirely by their owners, often in back yards or in makeshift shops, then by professionals on a custom, one-off basis, and finally by organized production builders. All three methods are still used, but now the production builders predominate; most are located in France and New Zealand. Production methods vary from the wood /epoxy technique popular with owner-builders to full-on aerospace composites of foam, fiberglass and carbon fiber. Welded aluminum is used in the large, commercial and military vessels.

C15 Lifestyle

Living among the multihulls is exciting, all right, but the essential, even subliminal, attraction is *identity*. By participating in this sea change in marine architecture, one finds something distinct and fresh upon which to hang his hat. A commonly heard admission is, "If it weren't for these boats, I don't know what I would be doing with my life." This level of commitment serves as a filter. If you can pass through, you are automatically accepted into an exclusive group of colleagues, and the stories of what one's multihull

boat has meant – and still means – in one’s life are not all positive, not all enviable, but all authentic, compelling and close to the bone.

Further submissions and critiques to this treatise are invited.

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