

HOT BuOYS S.V. Rigging Part 1



Marshall Islands

A rig designed to:

- Suits owner's need;
- Suit the sailboat;
- Survive 145 knots;
- Be affordable
- Use traditional sails

The purpose of this presentation



Cebu Philippines

Is to explain how:

- Objectives of a cruising sailor;
- Coupled with logic and field testing;
- Evolved into the rig for HOT BuOYS

Suit owner's needs



Kayaking in Palau

- I am a cruising sailor.
- I put **SAFETY FIRST**.
- I have a small crew.
- I don't race.
- I want to go to wind (upwind).

Everyone is selling something.

I claim a racing Bermuda rig is the wrong rig on big multihulls for cruising sailors.

I don't expect everyone to agree me. If a few sailors understand what I am doing, then I am content. I don't expect you to run out and change your own sailboat.

Negative Bermuda rig experiences

I'm tall. A few bumps into the boom led me to think this thing needs to go.

I don't like taking risks. Changing foresails in high waves and winds is risky.

I really don't like having to go up the mast in a squall because the mainsail is stuck. Further, big sails take me too long to reef.

On other boats, I have seen sails blow out, and I had to restitch all the baton pockets.

My boat's negative experiences:

The high loads have ruined large blocks.

Batons broke and pierced the mainsail.

Halyards wore out quickly.

The roller furler jammed in a squall.

The rigging lines were under high tension.

One of the main rigging lines broke.

The mast came down on the pilot house.

The mast could have killed the former owners.

Priorities for a new rig

1. SAFETY FIRST

2. To wind

3. Price...

99. Racing

S A F E T Y F I R S T

I am an engineer. It was my job to make the world's most dangerous things safer. I worked on nuclear and petrochemical plants.

No plant I designed has ever blown up.

It is my contention that, if engineers like me designed sailboats and put SAFETY FIRST, that Bermuda rigs would be confined to racing and coastal sailboats.

Argument against multiple sails

SAFETY FIRST

- A Bermuda rig requires trained crew to raise, lower, pack, adjust, and tune at least two sails.
- A Bermuda rig's sails are not well suited for going downwind. Therefore, large sails like spinnakers are flown. Sometimes this gets ridiculous. On one racing boat I helped raise/lower 4 different spinnakers in one day.

Cruising sailors have small crews



Three first time sailors on my sailboat.

SAFTETY FIRST

Forces an owner to consider the fact he has:

- A small team:
- Fewer hands;
- Limited sleep;
- Less experience

Bermuda = Piano = Confusion

There are many different lines to adjust and raise multiple sails. Sailors call these lines collectively the piano.

On one rig I saw 23 lines.

When a quick adjustment is required, is this safe?



Tacking without touching a line

SAFETY FIRST

- To tack a Bermuda rig, you must release and reload several lines under tension using winches and winch handles. After tacking, you then must adjust the lines to trim the sails.
- To tack HOT BuOYS just turn the wheel.
Even a small child can tack a 65 foot trimaran.

A safe sailboat should be boring

A crew member once told me I had the
“World's most boring sailboat.”

At first, I was offended. However, I realized they were used to action. My new rig doesn't require constant attention.

I'm content with a modest upwind speed. Instead of being terrified, I like feeling safe and in control. I have more time to practice my piano or read a book from the ships library

Argument against the mainsail

SAFETY FIRST

- A Bermuda rig's mainsail requires a boom. Booms are the most dangerous thing aboard. They directly injure, kill, or knock sailors overboard.
- Large mainsails require expensive baton cars. Despite their expense, mainsails still get stuck in the up position. This endangers crew, mast, and sailboat.

Argument against high loading

SAFETY FIRST

- I play the piano and worry around equipment like winches. Winches handle the big loads necessary for a Bermuda rig's sails. They must be shaped correctly to perform. Reducing loads makes operating a sailboat safer.
- Sheets for big foresails get caught on inner forestays, rigging, and the mast. This forces crew to go to a dangerous area.

Argument against split rig

SAFETY FIRST

- A Bermuda rig is a split rig with multiple driving sails and a slot between them. If you believe in “slot theory”, review facts in later presentations. Research has proved one lifting sail is more effective.
- Changing to one sail allows rigging to be hand-tight, and balanced. Standing rigging never goes slack. There is little precompression.

SAFETY FIRST & Standing Rigging

- If you sail a typical multihull's Bermuda rig, all standing loads shift onto just 2 chainplates.
- If you sail HOT BuOYS, all standing loads shift onto 6 chainplates.
- HOT BuOYS has 300% more chainplates sharing lower loads than a Bermuda rig.
- HOT BuOYS rigging is dynamic and 4 chainplates never go slack.

SAFETY FIRST & Standing Rigging

- Bermuda rigging is pretensioned and kept under high tension during sailing. Each line pulls 1 time at 1 angle. This translates into mast compression, damaged chainplates, and broken rigging.
- HOT BuOYS rigging is tensioned hand-tight. One of the lines pulls 6 different times at 6 different angles. Rigging is compounded!

SAFETY FIRST shaped the rig

Bermuda Rig:

- Boom hits heads
- Manual jib sheets
- High tension rigging
- Jammed track cars
- Trained crew a must
- Unbalanced rig loads

HOT BuOYS Rig:

- Boom eliminated
- 100% Self-tacking
- Hand tensioned
- No track cars
- Novice crew okay
- Balanced rig loads

Again, it is fine if you like the Bermuda rig. It is fine if you think it is the best rig to go to wind.

I'm just asking you to consider what is right for a big multihull for a cruising sailor.

Theory versus practice

In theory, a Bermuda rig on a multihull should go to wind. However, in practice, cruisers laden their boats with fuel, water, food, batteries, sails, tenders, chain, rope, spares, and tools. Cruisers themselves are heavy and bring baggage. Don't forget blackwater. Two full 75 gallon tanks weigh about 1,200 lbs. Yuck!

Theory versus practice

In theory, a big full baton Marconi mainsail, that is part of a Bermuda rig, should power a multihull into the wind. However, in practice, cruising sailors worry about being overpowered so they reef during passages.

Can a cruising multihull make windward progress with the mainsail reefed?

Theory versus practice

In theory, sailing should be enjoyable.
However, the former owners of my boat said
their Bermuda rig “**terrified**” them. It
pounded into oncoming waves.

The boat went far too fast for their ability.

They didn't feel safe or in control.

So they always sailed on the third reef.

The rig failed the former owners.

My sailboat's former owners made multiple attempts to get to Hawaii and failed.

Eventually their attempts may have led to their demasting.

Was this a designer or end user mistake?

My vote is designer mistake. The couple were very capable. The Bermuda rig when used in practice could not safely go to wind.

Cruising multi-hulls: To wind?

This is a challenge! Can any multihull with a Bermuda rig, laden with a typical cruiser's supplies, go to wind with the main reefed to the third reef?

I needed to put a new rig on my boat that would go to wind and get me to my home in Hawaii.

Since a Bermuda rig failed the former owners, why should I expect it to succeed for me?

HAWAII

In the Pacific, the coconut milk route from California to Mexico and across to New Zealand and Australia is mostly downwind. Getting back is a big problem for cruising Bermuda rigs. Even monohulls have difficulty getting back to California. Most sailboats are shipped back, or never return.

This was unacceptable

I had to get my sailboat back to Hawaii. It had to go to wind for my planned route. I did not want to push North of Japan and into the debris from the recent tsunami.

I looked to traditional multihull sailboats. How could I modify my sailboat to get to Hawaii? Polynesians could cruise upwind to Hawaii.

To wind goal shaped the rig

Bermuda Rig:

- Full baton mainsail
- Multiple sails
- Drives bow down
- Maybe upwind if fast
- Exciting sailing

HOT BuOYS Rig:

- Traditional lifting sail
- One sail
- Lifts bow up
- Slow upwind proven
- Boring sailing

\$ Big Main Small Budget tenance \$

Cruisers in general are not wealthy. We try and stretch our savings.

I worry when I go to a sail loft. Each time I go there, I see many sails in for repairs. How soon will I have to bring my sails in for repair? How much will that cost?

Anything I could do to limit sail wear and tear interested me.

Want a good sewing machine?

There is a good reason most sailboats like mine carry big expensive sewing machines. The former owners of my sailboat used theirs frequently.

However, sewing isn't something I enjoy. I've found sewing big sails while at sea very difficult. Therefore, I am pleased my new rig has no mainsail, no batons, and that the sails don't flog when coming about.

Look closer at the mainsail



A full baton mainsail, is an attempt to gain sail area away from the mast.

The mast is the problem. Even a rotating mast disturbs the airflow.

The downside of batons



- Baton break and pierce the sail.
- Pockets wear out, & cause turbulence.
- Baton cars are expensive.
- Sails are harder to raise and lower.

You can't easily source a Bermuda rig overseas

- No local stores stock big standing rigging.
- Everything is expensive and must be imported.
- Orders must be placed in different time zones.
- Air shipment is expensive.
- Now add on up to 150% import duty.
- Meanwhile:
 - I was working over 12 hours a day at the yard.
 - I was working 6 days a week.
 - I had to supervise painters and carpenters.
 - I had to source all other materials.

The last straw

After spending many long nights on the Internet, I finally came up with a list of rigging materials and track cars. It took another two weeks to get a quote. A large US supply house had to wait for manufacture quotes before giving me a price.

Shipment was going to take 4 weeks. Then there was time to wait in customs. The final price tag was too high.

The Titanic costs of a Bermuda

My sailboat was built by a California couple that built custom boats for a living. If you saw the remake of the movie The Titanic, you were looking at a detailed scale model they built.

I didn't have the big checkbook they had when building my sailboat. Further, they had access to US suppliers, ground shipping, and zero custom duties. Installing a similar rig while overseas was going to cost me about double US costs.

The tale of the 8 winches

Once upon a time a farmer wanted a very big plow. The blacksmith said, *'I will gladly make you one, but you will need a two big oxes to pull it.'* The farmer bought two big oxes. He went to the rope maker. The rope maker said *'Use these big ropes to tie your ox to the cart. These ropes tell your ox to go left and right, these ropes are to tell it to start and stop.'* The farmer looked at the ropes and realized they were too big for him to hold. He went to the hardware store, and the merchant rubbed his hands with glee. *'Here is your order sir! Here are 8 magical devices called winches. These 4 tell your oxen to go left or right, these 2 tell them to start, this 1 tells them to slow down, and this 1 stops them completely. Thank you, thank you!'* said the happy merchant.

So the farmer went home. He attached his two ox to his big plow. He plowed his field fast. He was happy. Happy, that is, until one day his two big ox dropped dead. His plow was now stuck in the barn. All the money the farmer spent on the big plow and 8 winches meant nothing. He could not farm anymore. The bank took his farm. Our sad farmer now pulls weeds for the farmer next door and lives in a shack.'

Low price goal shaped the rig

Bermuda Rig:

- Special rigging wire
- \$\$ turnbuckles
- Special fittings
- \$\$ end treatments
- Many winches
- High maintenance

HOT BuOYS Rig:

- Local wire and rope
- Strain insulators
- Galvanized fittings
- Simple knots
- Only 2 needed
- Low maintenance

This is not a racing boat!



Didn't the original rig designer notice the 1006 lb engine. Didn't he see the size of the battery banks, fuel tanks, and water tanks?

Clearly the big racing Bermuda rig installed on my sailboat was a mistake.

Cruisers don't usually race:



Not racing means:

- Safer crew;
- Safer boat;
- Smaller sails okay.

These racing crews and racing sailboats don't look very safe to me. Is designing something likely to cause harm good?

Not racing goal shaped the rig

Bermuda Rig:

- 79 foot tall mast
- Multiple sails
- Full baton mainsail
- Racing crew
- Upwinding is scary

HOT BuOYS Rig:

- 62 foot tall mast
- One sail
- 0 batons
- Novice crew
- Low speed upwind

Is a Bermuda rig okay?

I firmly believe that it isn't the best option for cruisers.

- We have smaller crews
- Unskilled crews
- Smaller budgets
- Sail 24-hours a day
- Can get hit by sudden violent squalls

“Adequately crewed”

So, How many sailors are needed to “adequately crew” a big Bermuda rig?

Was a retired couple in their 60's soon to be in their 70's adequate?

In the cruising community, you usually only see one retired cruising couple per multi-hull no matter the size of the sailboat or age of the couple.

Downwind sails on Bermuda rigs

Many big-Bermuda rig sailors raise downwind sails to overcome two issues:

One sail does not act effectively for both upwind and downwind conditions.

When sailing downwind, the shape of the both the typical foresail and mainsail spills most of the wind. Only one side of these sails can be let out.

Downwind sails safety issue



A fixed forestay forces crew to the bow to raise and lower sails.

Changing sails between upwind and downwind sails requires man power. The larger the sails the more man power required. These crew all risk injury or worse. Sails are damaged too.

Are trimarans too stable?



My sailboat is a 65 foot long by 40 foot wide trimaran.

Because it is so stable, the original rig designer:

Are trimarans too stable?

The designer,
Convinced the
former owners to
go with a massive
Bermuda rig and
full baton mainsail.



Are trimarans too stable?



Multi-hulls are wide and won't spill the wind during a heavy gust. Therefore, the mast and rigging must stand against peak gusts in a squall or typhoon.

Stability good for a Bermuda rig?



The designer told the former owners they can just reef down when the winds get high.

He sold them seven winches to control the sails. Hmm...

Trimarans: Too stable?

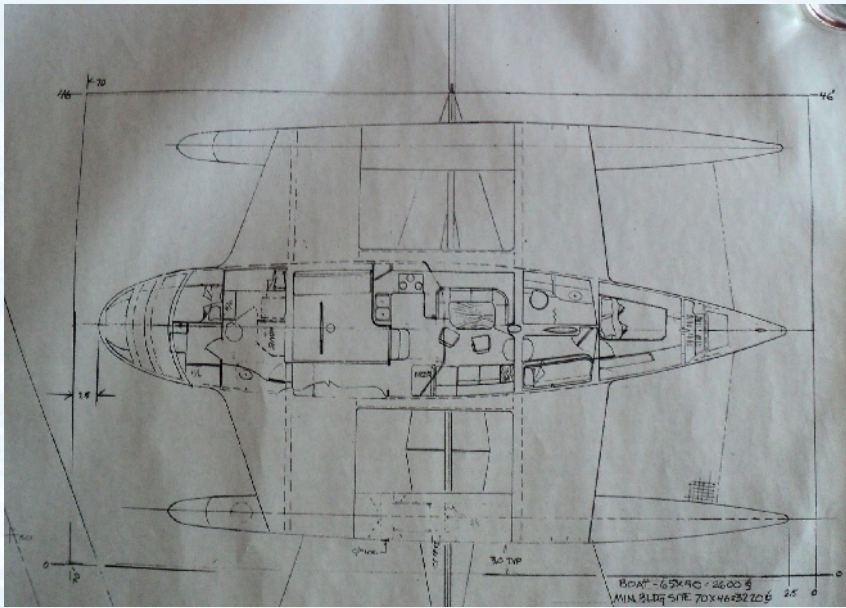
HOT BuOYS 40 ft beam = Stability
Photo shows jury rigged mast used
Mashall Islands to Thailand



The photo at left shows my sailboat with a jury rig I installed after the first mast came crashing down.

The former owners were in their 70's.

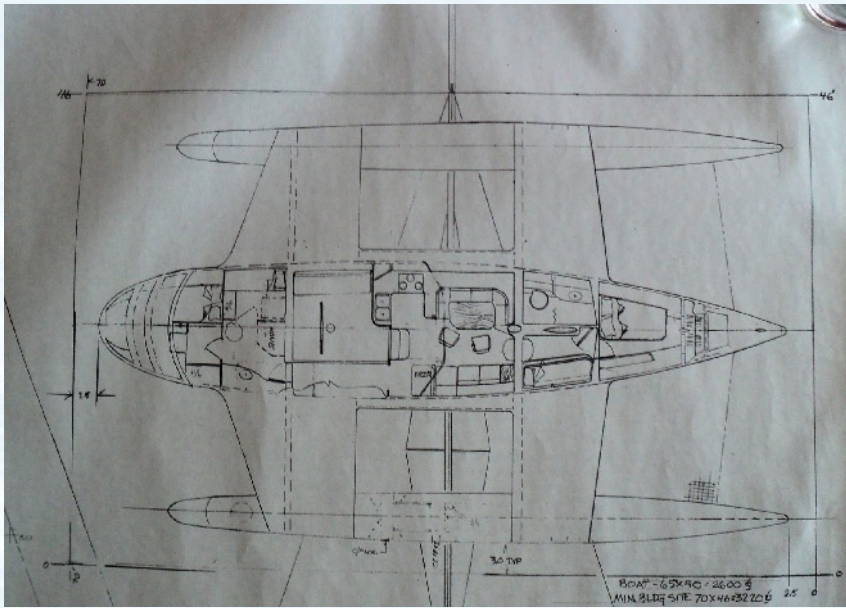
Multihull tacking issue



When attempting to tack, large cruising multihulls tend to stall and fail to go through the wind. This is called being in irons.

A multihull's light weight makes doesn't have much momentum.

Multihull tacking issue

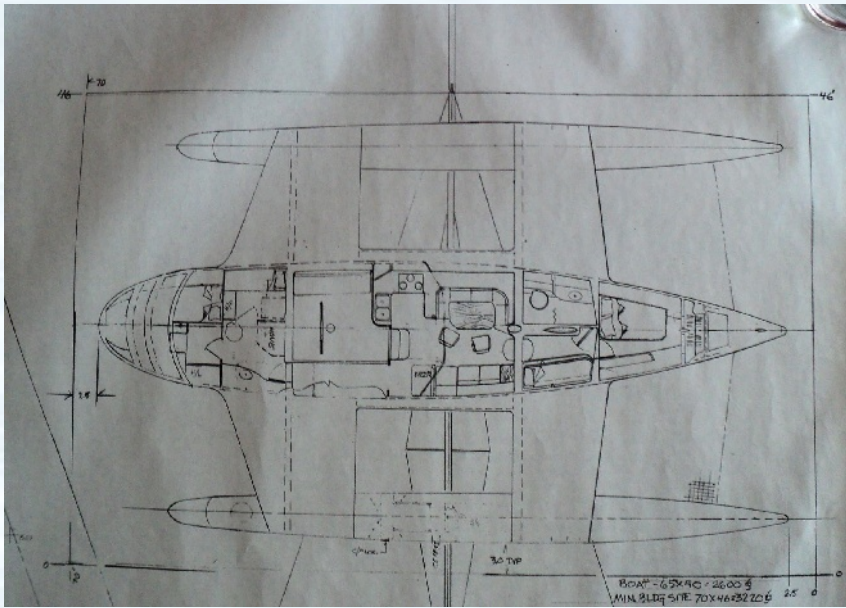


The longer it takes, and more often a sailboat tacks, the more the sails are flogged. Being in irons is hard on the sails and crew that have to run around and attempt to regain speed to attempt a tack again.

Multihull tacking issue

To counter this issue, many multihull owners will turn on an engine to power the boat through the tack.

My trimaran could not tack without engine assist unless going very fast.



The mainsail: Waste of money?



A mainsail to a cruising sailor is:

- A maintenance headache
- Safety concern
- Doesn't provide much speed

The mainsail: A waste of money?



When I purchased my demasted trimaran, I examined the mainsail.

Over the years it was repaired and repaired.

Broken batons pierced the sail. Baton pockets were a mess.

Argument against the mainsail

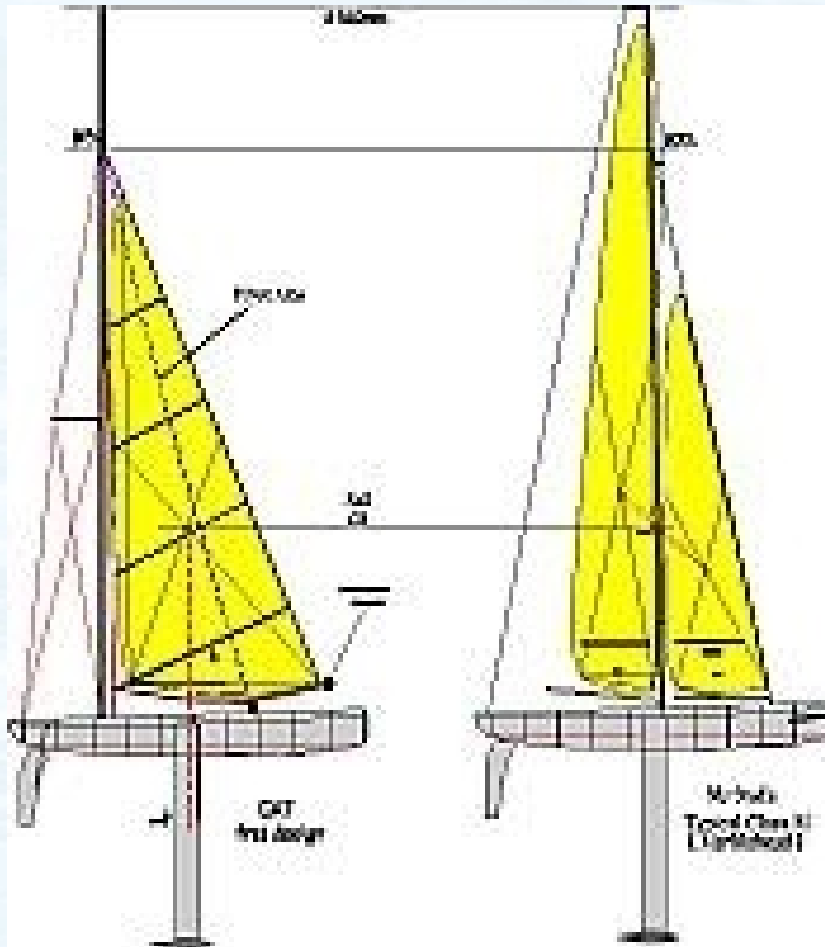
Many cruising sailors sail with the mainsail reefed. Some keep it down completely.

Few cruisers have crew or time to reduce sail before a sudden squall.

A big main helps a boat go upwind.

However, most cruisers plan their routes for downwind. One cruiser sailed upwind just 10 days in 5 years. Some never go upwind.

Why not eliminate the mainsail?



- Makes a safer boat
- Reduces mast size
- Simplifies
- Reduces expenses
- Eliminates wasted sail area that is not effective.

In places like S. E. Asia

Wind conditions are commonly either:

- No winds at all; or
- Strong sudden squalls.

Neither case justifies a big mainsail. The very tall mast used to fly a mainsail is a liability. Ask a trimaran owner here in the Philippines. His sail wasn't even up when a typhoon knocked his tall mast down.

Bermuda rig: Unhappy cruisers



- Ask long term big multi-hull owners if they are happy with a Bermuda rig.

Anything ever go seriously wrong?

Bermuda rig: Unhappy cruisers



Look especially for big multi-hull owners.

One California based trimaran owner told me almost the identical story as the former owners of mine.

He too wished he never listened to a designer who said you just reef it in high winds.

Super typhoon Yolanda

I considered local conditions when designing my new rig. Typhoons are common here. I used 145 knots as my design case. Super typhoon Yolanda tested HOT BuOYS' new rig shortly after it was up. Peak eye winds were 380 kph (235 mph). The eye missed, however, trees in front and behind the sailboat were uprooted. The 23rd typhoon to hit this years is just hours away.

Hunkering down for Yolanda



HOT BuOYS rig is always ready for a typhoon. To prepare for Yolanda we put more lines to shore, and protected pilot house glass. Hot boy Reynon found the big yellow hat. The trees in background were downed by Yolanda.

Summary 1

A rig designer should not cookie cutter a Bermuda rig onto every sailboat they design.

Instead, a rig designer should look carefully at the owners who will use the sailboat, consider their abilities, consider their goals, and the size of the sailboat.

Summary 2

While a Bermuda rig when fully utilized may be fast and make windward progress, the problem with the rig for a cruising sailors is they have limited crew and/or desire to go fast.

Therefore, they tend to sail Bermuda rigs reefed down where they have trouble making windward progress. The merit of the mainsail becomes questionable.